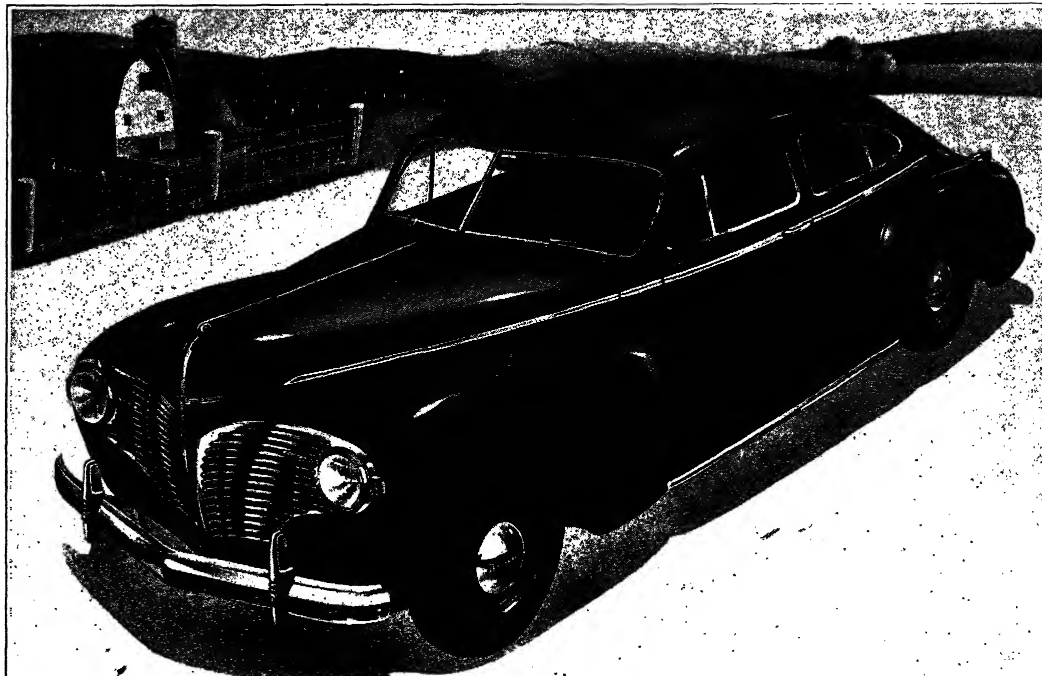

1941 DODGE FLUID DRIVE TWO-DOOR SEDAN
Courtesy of the Chrysler Corporation

AUTOMOBILE ENGINEERING

A HOME-STUDY COURSE AND GENERAL REFERENCE WORK

on the Construction, Care, and Repair of Cars and Trucks; on Ignition and Starting Systems; also Instructions on Diesel Engines; Service Station Operation

Prepared by a Staff
of Automobile Experts
Under the Supervision of

RAY F. KUNS

Technical Editor "Automobile Digest"
Principal, Automotive Vocational High School, Cincinnati
Public Schools, Member of Society of Automotive Engineers

OVER FIFTEEN HUNDRED ILLUSTRATIONS • SIX VOLUMES

1945

AMERICAN TECHNICAL SOCIETY
CHICAGO, U.S.A.

Reprinted 1944

THIS BOOK IS COMPLETE AND UNABRIDGED.
It is printed on light-weight paper in conformity with government regulations for conserving paper pulp.

Printed in U.S.A.

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Acknowledgments

GRATEFUL acknowledgment is here made also for the invaluable cooperation of the foremost Automobile Firms and Manufacturers, listed below, in making these volumes thoroughly representative of the very latest and best practice in the construction, operation, and repair of Automobiles, Aviation Engines, etc.; also for the valuable drawings, data, illustrations, suggestions, criticisms, and other courtesies.

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FOREWORD

ALTHOUGH recorded history is not wholly agreed as to the first man in America to perfect and operate an automobile, this honor is generally accorded to Charles E. Duryea of Springfield, Massachusetts, who on September 12, 1892, operated a Duryea gasoline automobile in that city. By the year 1900, a number of "gasoline buggies" were in process of manufacture and by 1910 automobile building in the United States had begun to assume serious proportions. Quantity production methods have resulted in the building of over fifty-five million passenger cars and almost four million trucks.

Approximately, five hundred thousand persons are engaged in the production of automobiles, with a payroll of approximately seven hundred million dollars each year. The total number of jobs made possible by motor transport, which includes automobile manufacture, petroleum refining, sales and servicing, road construction, etc., is over six million each year.

Our highway systems total over nine hundred thousand miles of hard surfaced highways. Expenditures for highways in a recent year totaled approximately one billion dollars. Taxes paid by the automobile industry total almost one and one-half billion dollars yearly. Gasoline consumption is estimated at about twenty trillion gallons yearly and the consumption of automobile tires is in excess of fifty million. It is estimated that the vehicle miles traveled are more than one hundred fifty trillion yearly.

As a result of the highly developed skill of automobile production, the call for old-fashioned *repair service* is gradually being displaced by a call for a new type of man trained in *maintenance service.*

Perhaps the first line of defense, so to speak, against the needs of the modern motor car is the list of three hundred and twenty-five thousand gasoline service stations offering maintenance service in varying degrees. Next in point of number comes sixty-five thousand general repair garages and then some thirty-five thousand car dealers. The men required to man all of these stations require specialized training.

Specialized equipment has been developed, designed to help the garage men diagnose motor car troubles. It is a matter of record that the scientific equipment is more accurate than the human element and the up-to-date stations are requiring men who can handle this type of equipment.

There is no need to guess the type of lubricant required by any part of the automobile, nor is there any need to make an estimate or guess as to the exact amount of clearance to be allowed at any one point in the adjustment of the intricate automotive assemblage. Accurate information is provided in the way of lubrication charts, wiring diagrams and data sheets.

Service men have taken it upon themselves to attempt to make the automobile fool-proof and to make it a safer vehicle to go upon the highways. This has resulted in safety campaigns in the servicing of brakes, headlights, and the third vital item, front axle and steering geometry.

Although the principle of the Diesel or oil engine is practically as old as that of the gasoline engine, which has been developed on the Otto cycle principle, it was not until comparatively recent years that the Diesel has begun to find a very large place in the transportation field. Diesel engines have been speeded up and light weight Diesels are being rotated approximately as fast as heavier gasoline engines. The Diesel engines are finding their place in road tractors, road machinery, farm tractors, buses, and trucks. The auto-mechanic, who has a well-grounded understanding of the principles and practices common in the automotive field, has little difficulty to transplant himself into the Diesel engine service field. It is anticipated by many that further development of the Diesel will insure its place in the passenger car transportation field.

In the automobile racing field there have been a number of outstanding developments within recent years, chief of which is the propulsion of a motor vehicle over the salt beds of Utah at a speed in excess of three hundred miles per hour. Each year has seen the breaking of speedway records with higher and more efficient performances and records. There has been a tendency for road racing to come back into favor and this is being looked upon with special appreciation by some car manufacturers who are desirous of increasing the performance of their particular automobile. In this field the competition of foreign-made automobiles is being felt.

Considerable interest continues to be exhibited in the possibilities of a rear-engined power plant. More complete streamlining is always a matter of consideration by engineers. Fuel economy is receiving much consideration and is destined to play a part in engineering practice more and more. In the truck and tractor field for highway transportation of freight, there is a definite tendency toward the use of the pancake type of engine with the cab over it at the front of the vehicle. Outstanding examples of free design in engine placement are in placing engines behind the rear axle in buses and the use of the twin drive.

A great deal of the short haul business, which was handled at one time by the railroads, is now handled by trucks and tractor-trailers. The use of light-weight, high-speed, high-compression engines, similar

to those utilized in the passenger car field, has become a general practice in highway freight service. This serves to prove the contention of automobile engineers that the automobile has a great deal more power than is really required for ordinary passenger car use. This fact has fostered the development of the house-type and display-type trailer coach drawn by passenger cars.

The last few years has seen a standardization taking place in the aviation field with the result that aviation industry is partaking more and more of the nature of a large public utility, such as a railroad or a steamship line. Young engineers interested in a life of service in this industry need to recognize this particular fact. The training required by these individuals is of an exceedingly high order. For every ship in the air there is a crew estimated at from five to ten men on the ground. It is in this field that many young automotive engineers are finding an outlet for their skills. It is now possible to travel into almost any part of the United States within twenty-four hours by means of regularly scheduled air-line service. It is also possible to travel into almost any part of the globe at exceedingly high rates of speed, using only the regularly established air-line service. More and more we are finding that mail, express, and freight are being handled by this service. Some of the most interesting and recent developments in the mining field, in the North American Continent and elsewhere, are being made possible through the use of the airplane for transportation of men and mining machinery into out-of-the-way places. While it is true that the development of light aircraft for personal use of the aviator has had more or less of a quiet season, impetus is being given to this development by certain work of the Civil Aeronautics Authority of the Federal Government.

Intimately tied up with all of the various phases of automotive progress in the field of transportation is the question of man-power. The automotive industry continues to afford to red-blooded American youths, who are willing and anxious to train themselves in the highly technical lines of service, one of the most popular and profitable fields of training and service. The young engineer, however, must realize that with all of the romance and interest in any phase of this great industry there comes also the need for scientific and exact application of knowledge and skill.

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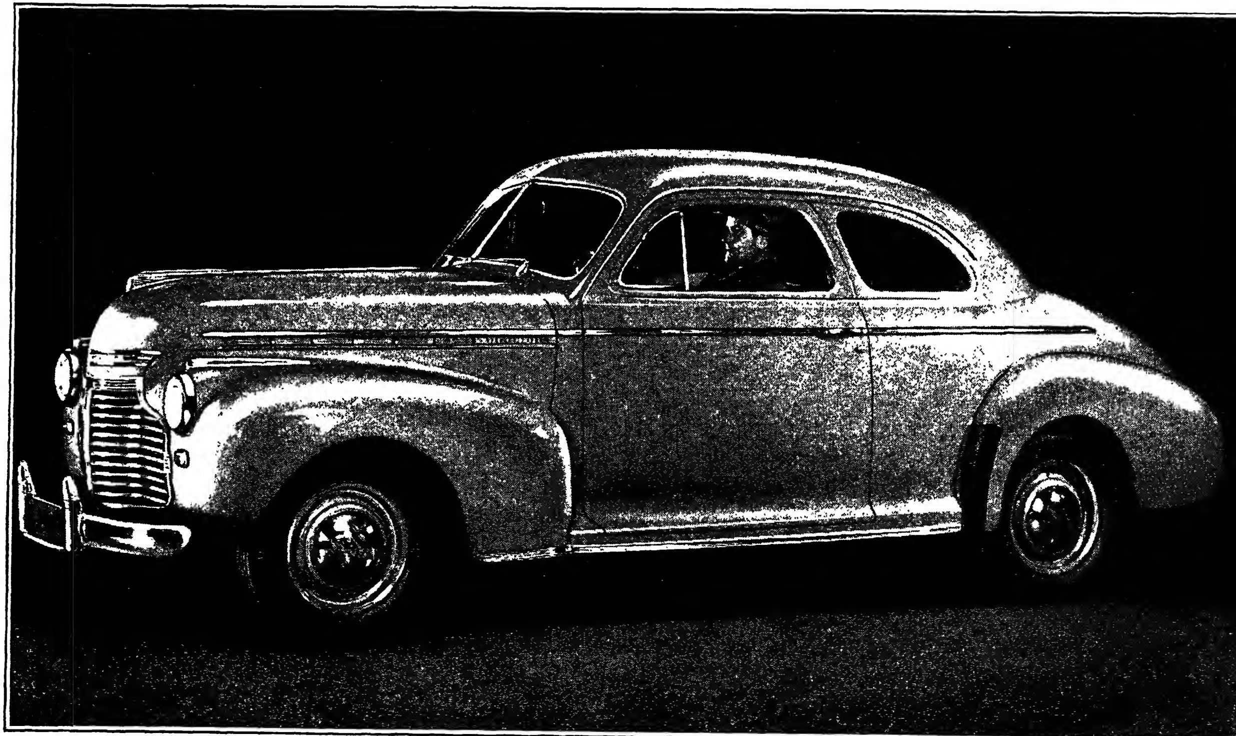

1941 CHEVROLET MASTER DELUXE FIVE-PASSENGER COUPE
Courtesy of Chevrolet Motor Division, G. M. S. C.

PASSENGER CAR LIGHTING

The rapid development and widespread use of the passenger automobile have been dependent to no small extent upon the development and perfection of a satisfactory system of car and road lighting. The history of passenger-car lighting runs parallel with the history of the lighting of houses and buildings, oil lamps and gas lamps having been used in the early years of motor-car development. Today, with the perfection of a satisfactory system of electrical starting together with the generating and storing equipment, electric lighting has become the standard means of car and road lighting.

The electrical system of the passenger car is a complete generating and distributing plant. The generator produces the current, which is used directly for the lamps or other accessories or to charge the battery so that it, in turn, may provide the current when the engine and generator are idle. Bulbs have been developed which will consume this current and deliver light. The parabolic reflector has been used in the headlamps to intensify the light from the bulb and reflect it through the lens onto the roadway. The highly developed bulbs, lamps, and other parts or units of the electrical system of the modern passenger car are a far cry from the early models, but in the main the same general principles still hold.

LAMPS

Bulbs. The bulb may be of either the single contact or double contact type. By this is meant that in the case of the double contact the bulb is not grounded but two wires are run from the battery to the switch and then to the bulb for supplying current. The double contact system of wiring is seldom used, most bulbs being provided with the single contact, as shown in Fig. 1. This bulb, which is of the single contact bayonet type construction, has a double filament. This means that there are two contacts on the bulb. The two contacts on the bulb base are single contacts, however, inasmuch as each one of them is connected with one of the filaments, and the return from that particular filament is through the ground on the lamp base shell to the car ground. Thus, there are two separate

circuits with two contacts on the base, each of which might properly be termed a single contact, for a grounded circuit.

Bulbs range in size from the small ones of two candle power for the side and tail lamps to the large ones of 32 candle power for the headlamps. The small incandescent bulbs are usually provided with tungsten filaments. Inasmuch as the voltage used is low and the amperage is high, the filaments used are much shorter and stronger than those used for standard house-lighting lamps. A short and thick rather than a long and thin filament naturally makes for a bulb which will stand more rough treatment, and this is desirable in the

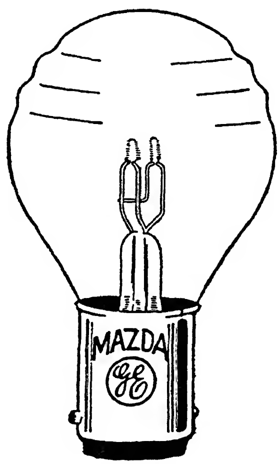

Fig. 1. Double-filament Headlamp Bulb

case of a lamp subject to the vibrations of an automobile. The candle power delivered by a bulb is directly dependent upon the voltage and amperage consumed. The two-candle-power bulb consumes .43 amperes at 6 volts. The four-candle-power bulb consumes .85 amperes at 6 volts. A bulb similar to the one shown in Fig. 1 has two filaments in it—one of 32 candle power and the other of 21 candle power. These bulbs will draw 3.9 and 2.8 amperes, respectively.

One reason for the rapid depletion of batteries in winter time is the number of bulbs in use on the automobile and the number of hours these lamps are being used. Naturally there is a direct relation between the total current consumption and the number of bulbs

being burned. All storage batteries are rated by ampere hours, meaning by this the number of hours the bulb will burn at a certain amperage before the storage battery would be depleted. For instance, if two headlamp bulbs were being burned at four amperes each, the total for the two would be eight amperes, and this would deplete the electrical energy of a storage battery, rated at eighty ampere hours, in approximately ten hours.

When it is remembered that car heater motors, cigar lighters, horns, radios, and other accessories are sometimes added to the lamp load, it is easy to understand that the total current consumption is in excess of the normal charging and generating ability of the usual generator. This condition has led to the installation of generators with greater capacity and especially those which are oper-

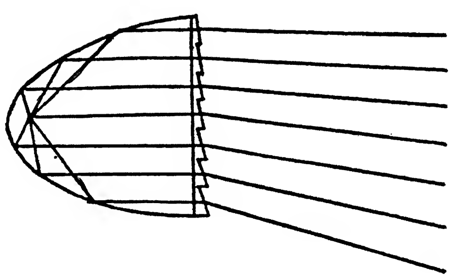

Fig. 2. Rays from Headlamp Are Tilted by Means of Prismatic Lenses

ated on the voltage control principle. Briefly, the voltage control principle of the generator is designed to supply current according to the needs or demands of the electrical units on the automobile, that is, the greater the demand, the greater the generating rate; the less the demand, the lower the generating rate.

Lamp Reflectors. A cross-section view of a parabolic lamp reflector fitted with a prismatic lens is shown in Fig. 2. There is a focal point near the rear of the reflector from which rays from the bulb are picked up by the polished surface of the reflector and directed in parallel lines forward to and through the lens. The point at which the source of light will cause all of the reflected beams to be reflected directly ahead is called the "focal point" of the reflector. Manufacturers of lamp bulbs work to very close limits in order that

the brightest part of the filament when lighted will be directly at the focal point. This assures the maximum amount of light to be picked up by the parabolic reflector and directed in parallel rays to and through the prismatic lens, from which point it is distributed forward to the roadway.

In the case of double filament bulbs, one of these is designed to be approximately at the focal point and the other one is designed to be out of focus a bit so as to secure a deflection of the rays of the lamp downward when the light switch on the car is thrown to

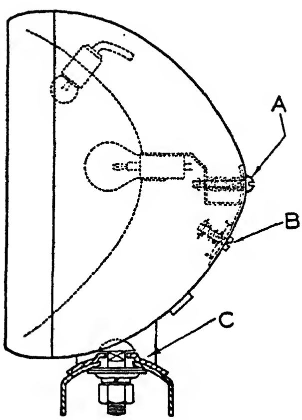

Fig. 3.
A—Bulb-Focus Adjustment
B—Beam-Lowering Adjustment
C—Lamp-Directing Adjustment

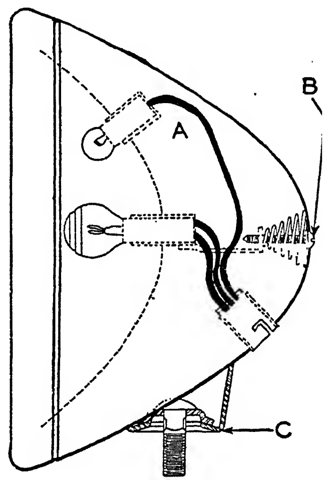

Fig. 4.
A—Parking Bulb
B—Bulb Adjustment
C—Lamp-Directing Adjustment

dim position. Ordinarily, the 32-candle-power filament is the one nearest in focus, the 21-candle-power filament being used for the dimming or passing position for the headlamps.

Headlamps. There are many thousands of automobiles in use which utilize lamps of the older type, as illustrated in Figs. 3 and 4, which show headlamps with bulbs designed for focusing. In this type of headlamp it is possible to both focus and direct the headlamp. By focusing is meant bringing the filament of the bulb into the focal point; and by directing is meant aiming the lamp to the proper position with reference to the highway to be lighted.

Later developments of headlamps have brought into general use the type of lamp illustrated in Fig. 5, which shows a two-filament

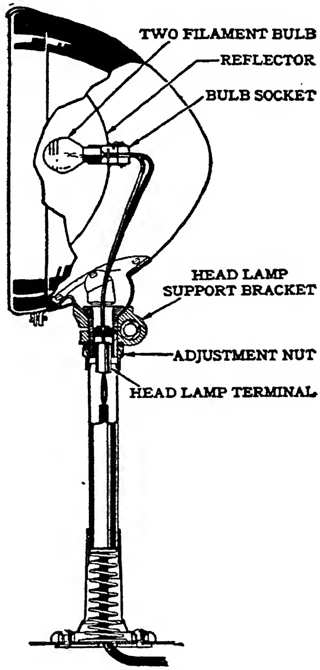

Fig. 5. Headlamp Bracket and Aiming Adjustment

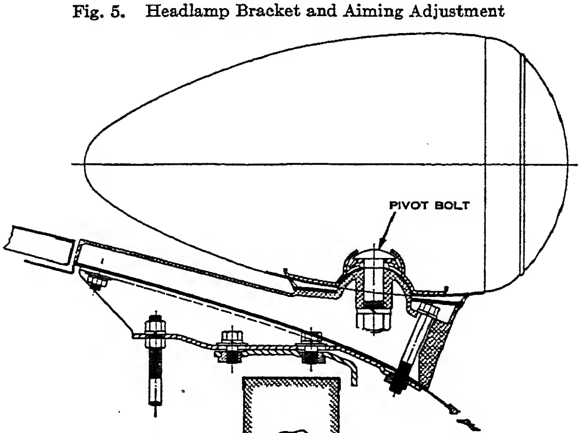

Fig. 6. Pontiac Headlamp Mounting

bulb in fixed focus. The only thing which it is possible to do with this lamp in order to improve the lighting of the roadway is to aim

the lamp so as to have the beam properly directed toward the highway. A cross-section view of a Pontiac, 1935, headlamp is shown

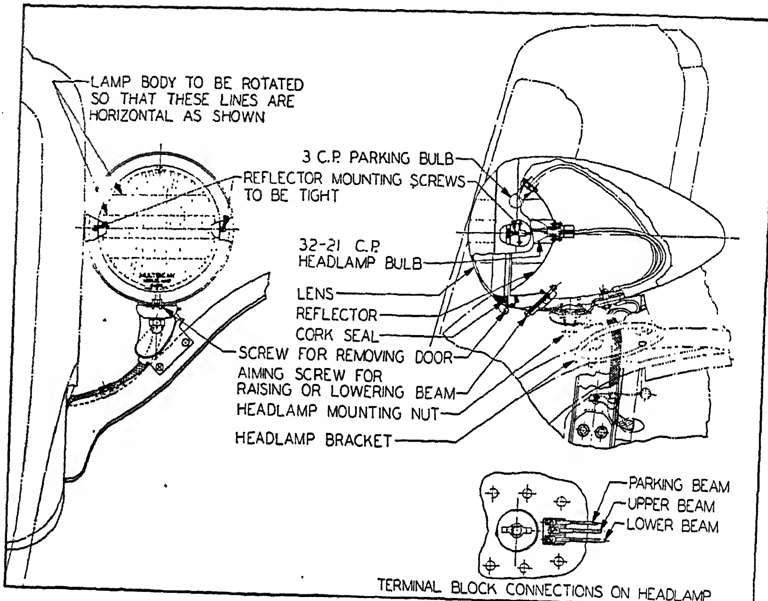

Fig. 7. Headlamp Mounting of Buick "40"

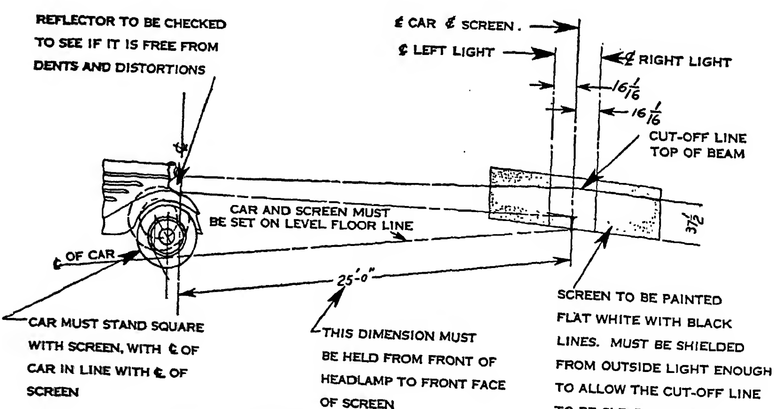

Fig. 8. Headlamp Aiming Chart—Standard Models
Courtesy Chevrolet Motor Company, Detroit, Michigan

in Fig. 6. A pivot bolt is provided which may be loosened and then the headlamp pivoted or adjusted over the spherical surface of the socket, in this manner directing the beam of the lamp properly. The

headlamp of the Buick, 1935, is illustrated in Fig. 7 in part sectioned view for the side.

When focusing headlamps, it is desirable to have the car placed in front of a focusing screen, similar to that shown in Fig. 8. The next point is to determine the type of adjustment provided on the

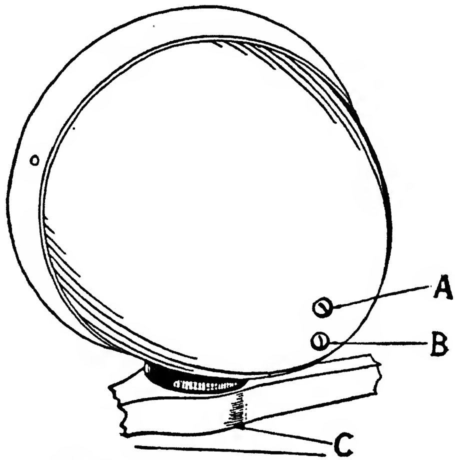

Fig. 9. A—Focus Adjustment
B—Ray-Deflecting Adjustment
C—Headlamp-Directing Adjustment

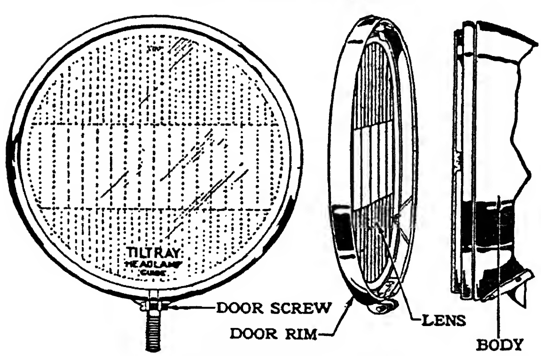

Fig. 10. Headlamp Door and Lens

headlamp to be adjusted. Not infrequently the adjustment screw is similar to the one shown at *A* in Fig. 9 or at *B* in Fig. 4. The adjusting screw should be turned in or out as necessary, in order to secure the best and most strictly confined light on the lighting screen. If it is not possible to secure a good beam, it may be necessary to remove the headlamp door and lens, as shown in Fig. 10. An in-

spection should be made of both bulb and reflector. If the bulb shows blackened sections of the glass, it should be replaced with a new one. If the reflector shows the effects of corrosion, it should be polished. Use a very soft cotton cloth and small amounts of lamp black and alcohol for the polishing operation. Do not press hard. If considerable quantities of dust are found in the lamp, it is due no doubt to defective gaskets; and these should be replaced.

As most automobiles are provided with fixed focus bulbs, all that is necessary when adjusting the light beam is to have the headlamp properly aimed, as shown in the headlamp aiming chart, Fig. 8. The car is placed 25 feet from the screen. The upper beam from the headlamp, Fig. 11 (top), should not be permitted to come above

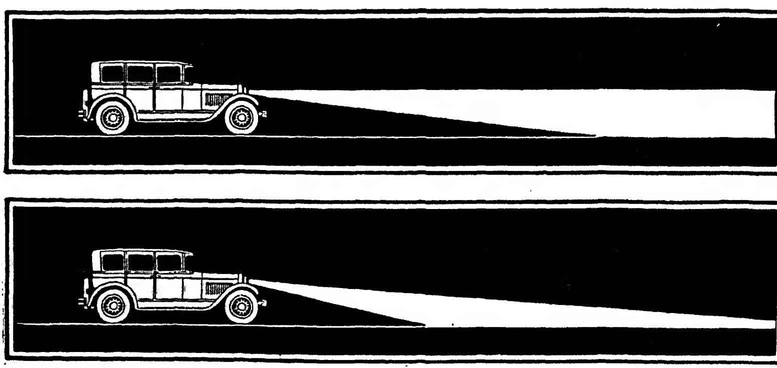

Fig. 11. Top, Upper Beam from Double-Filament Headlamps; Bottom, Lower Beam from Double-Filament Headlamps

the center line of the lamp when the lighting switch is on country driving position. If this is adhered to, there will be no time on a level road when the top of the beam from the headlamp will be above the vision of approaching drivers. The amount of deflection of the light beam is dependent wholly upon the effect secured when the light switch is turned on the dim or deflected position, Fig. 11 (bottom). This amount is determined by the distance between the upper and lower filaments of the light bulb.

Light Beams. If the lens of the headlamp is out of position, the beam from the headlamp is projected in a confined space and the reflection on the screen is circular; with the lens in place, there is a flattening of the beam so that the edges are thrown outwardly

toward the side of the highway. A great many combinations of light beams are possible. The most commonly used are illustrated in Fig. 12, where it will be seen that the upper beam from the right headlamp is projected to the right side of the road while the lower beam is held low on the left side. A similar silhouette is shown in Fig. 13 for the cross section of the beam for the left headlamp. The deflection of portions of the beam lower than other portions is due to the construction of the lens with which the headlamp is fitted.

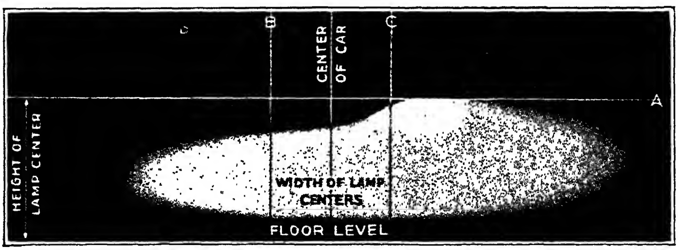

Fig. 12. Upper Beam from Right Headlamp

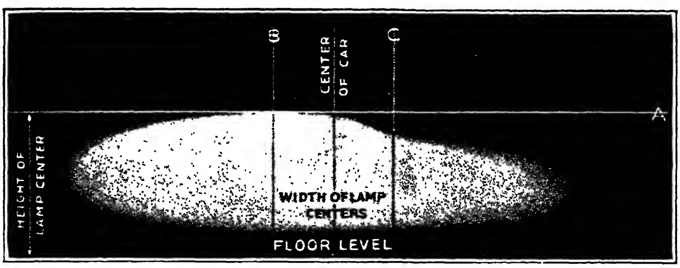

Fig. 13. Upper Beam from Left Headlamp

It is for this reason that a broken headlamp lens should always be replaced with a lens secured from the car dealer. Right and left lenses are not interchangeable.

A word of caution is necessary here, for not all lighting systems are according to the above. Some lighting systems secure from the left-hand lamp the illumination for the right-hand side of the road, while the right-hand lamp supplies the illumination for the left-hand side of the road. This type of lighting, as well as that described above, makes use of a symmetrical upper beam for use on the open

road. This beam is illustrated in Fig. 14. This system also makes use of a symmetrical passing beam which should be used when other cars are approaching. This beam is illustrated in Fig. 15. A third beam is a symmetrical lower beam for use on lighted highways or city streets. This beam is illustrated in Fig. 16.

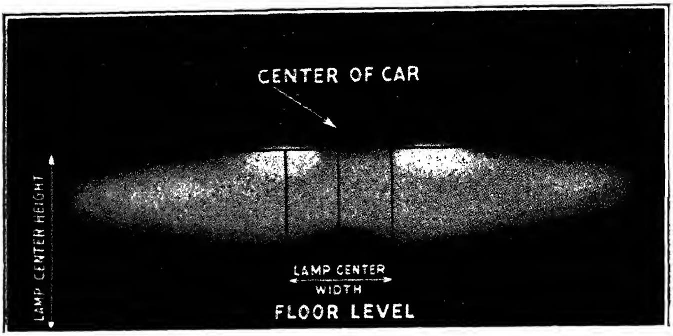

Fig. 14. Lights Correctly Aimed for Country Driving (Both Upper Beams—Right Headlights)

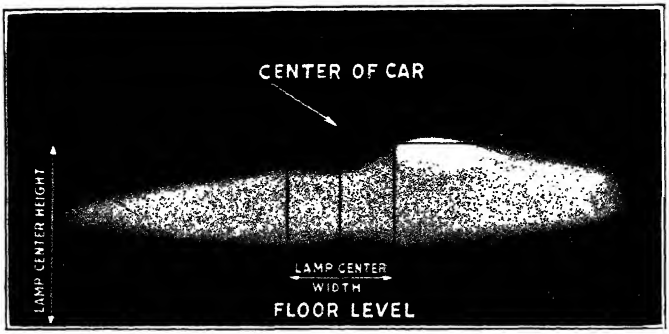

Fig. 15. Lights Correctly Aimed for Country Passing (Left-Hand Beam Depressed)

Light Switches. Light switches usually consist of two controls, one of which is mounted on the dash and the other one on the toe board, near the clutch pedal position. The Buick light control switch for instrument panel mounting is shown in Fig. 17. In the first position, with the knob pushed to "full in" position, headlamps, parking lamp, tail lamp, and instrument lamp are all off, that is, the switch is open. In the second position, which is out from the instrument board to the first notch, the parking lamp, tail lamp, and

instrument lamp are turned on. In the third position, which is a city beam, the headlamps low beam, tail lamp, and instrument lamp are in the "on" position. In the fourth position, with the knob pulled to the "full out" position, the country beam is secured, also

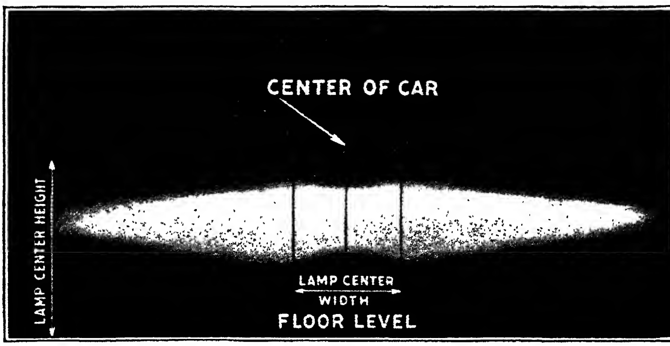

Fig 16. Lights Correctly Aimed for City Driving
(Both Beams Depressed)

the tail lamp and instrument lamp are turned on. In this position, it is possible to select either the country driving or passing beam alternately by pressing the foot selector switch on the toe board. Thus it is possible for the driver to shift from the country driving

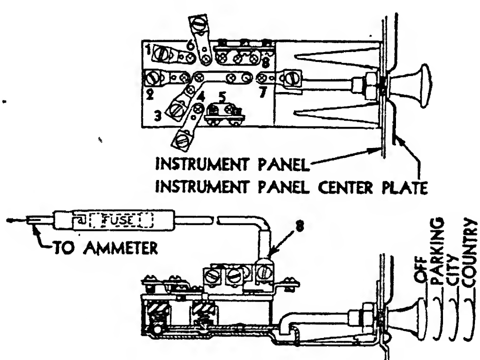

Fig. 17. Light Control Switch

beam to the asymmetrical passing beam without removing his hands from the steering wheel. This is highly desirable at high speeds. When driving at lower speeds, the foot selector switch may be set in the country driving position and the city beam used for passing

by operating the light switch control knob on the dash. When the switch lever is in the city position, the foot selector switch is in-

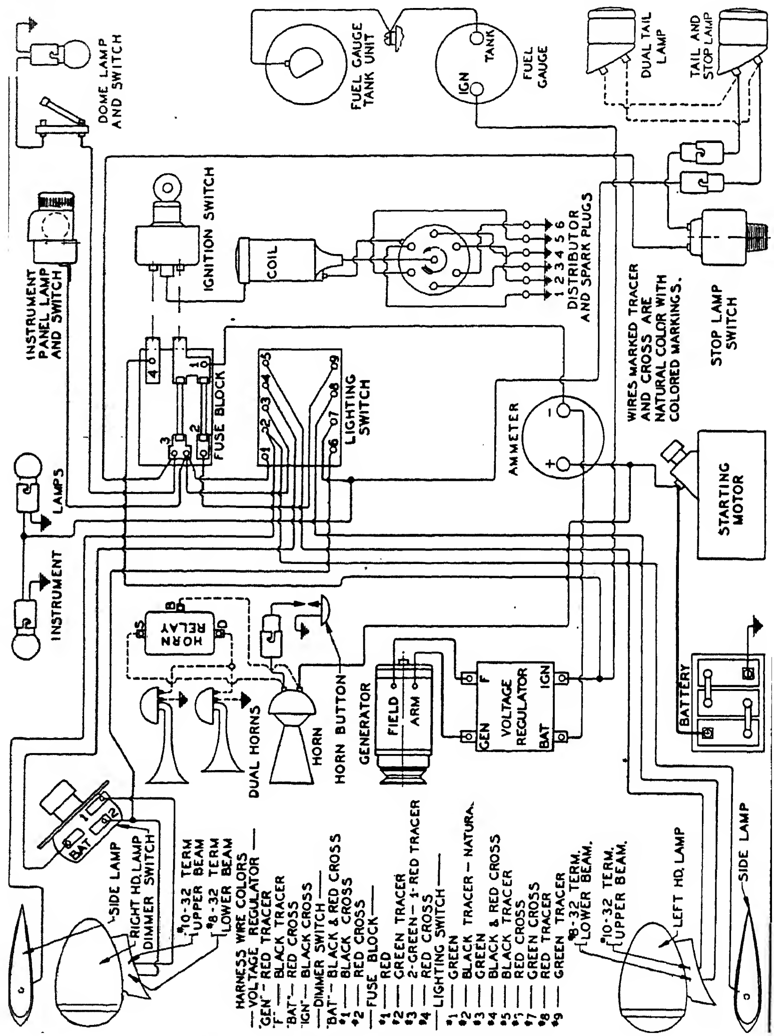

Fig. 18. Pontiac Six, 1935, Wiring Diagram

operative; thus, when driving on lighted streets where the surrounding illumination prevents distinguishing which beams are in use, the driver can ascertain which lights are being used by observing the position of the switch control knob.

Parking Lamps. Parking bulbs for the front of the automobile are sometimes included in the headlamp, as illustrated in Fig. 7; or side lamps may be mounted on the fenders or about the cowl of the automobile. The Pontiac Six, 1935, wiring diagram, Fig. 18, shows the wiring connections to the side lamps.

Instrument Lamps. Ordinarily, indirect lighting is used for the dash and instrument lamps, these being arranged to be switched off or turned on whenever the lighting switch is in any of the "on" positions. This is also true of the bulbs utilized in the tail lamps.

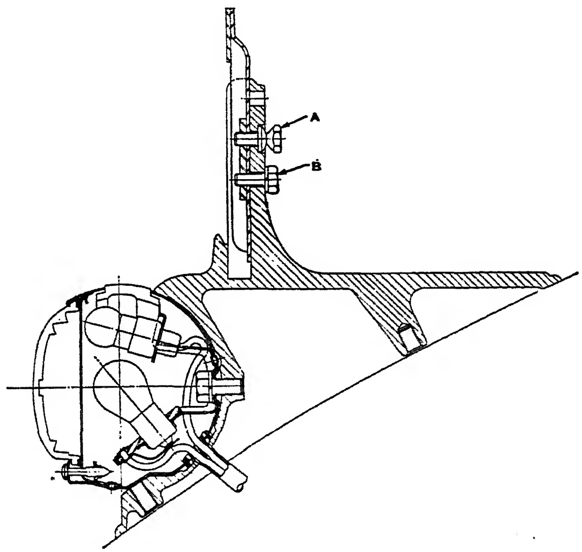

Fig. 19. Tail Light and License Bracket

Some cars do not have the instrument bulbs in circuit with the headlamp lighting switch, inasmuch as some drivers prefer not using the instrument light except in the case of an actual inspection of the instruments on the dash.

Tail and Stop Lamps. Tail and stop lamps are ordinarily integral, as illustrated in Fig. 19, which shows a section of the Oldsmobile 1935 stop and tail lamp. There are two bulbs. The larger one is the stop bulb and is of 15 candle power, while the small bulb, utilized for tail lamp lighting, is of 2 candle power.

Backing Lamps. Occasionally car manufacturers make use of a backing lamp, which is mounted so as to reflect the light rearward and which is so arranged and wired as to have the switch cut in and lamp lighted when the gear shift is put into reverse position. The back-up switch, Figs. 20 and 21, is connected in parallel with

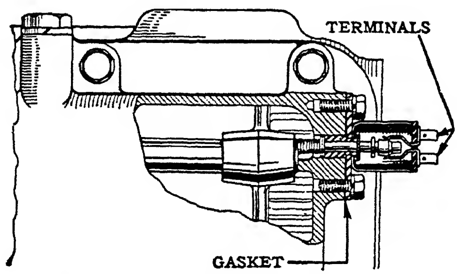

Fig. 20. Back-Up Light Switch—"On" Position

the stop switch so that both lights operate together. This then makes automatic the lighting of the way for the reversing of the car.

Dome Lamps. Practically all closed automobiles make use of dome or tonneau lights. These are ordinarily controlled by means of a switch on the post near the right-hand forward door. This

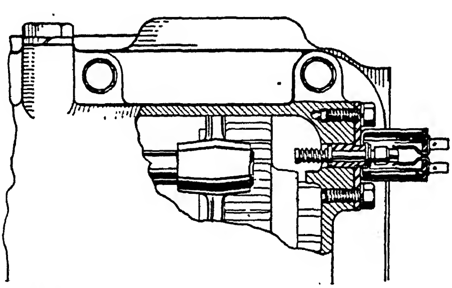
Fig. 21. Back-Up Light Switch—"Off" Position

method of wiring is illustrated in connection with the dome lamp and switch shown in the upper right-hand corner of the wiring diagram, Fig. 18.

Lamp Service Suggestions. If the lamp lighting is poor, check the bulbs. If the bulbs are found to be blackened, discard and install new ones. When installing new lamps, always be sure to install

the same type as those that have been removed. Many automobiles make use of a fixed focus headlamp bulb, Fig. 22. This pre-focused bulb can be installed in only one position. The bulb face is marked "top." When the bulb is installed, make sure that all three hold-down lugs enter the slots in the bulb base. Then, turn the bulb to the right so that the hold-down lugs are in the extreme ends of the slots. Make certain that the bulbs seat squarely and are held securely in place. When removing bulbs of this type, it is necessary to rock them on the base just a little to start them.

Usually right and left headlamps are not interchangeable nor are the lenses for them. As a rule, the proper lenses are marked

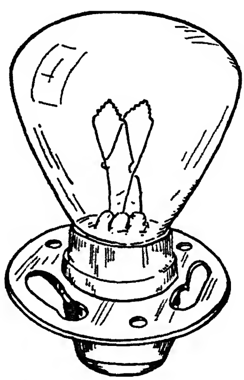

Fig. 22. Fixed Focus 32-21 Candle Power Headlamp Bulb

right and left, respectively. If the lights flare up as the engine is speeded up, it indicates a loose connection in the circuit from the generator to the battery. It is necessary to check the ammeter terminals to see whether they are tight. Next, see that the starting motor terminals are tight. And it is suggested that the battery terminals be removed and scraped so as to have them make good contact, after which they should be coated with vaseline. Check the ground connection from the battery to the car frame to see that it is tight and clean. If the bulbs burn out rapidly, the trouble is likely due to high resistance at some point, which, in turn, is due to a poor ground or contact. Go over the wiring system and eliminate any such found.

HORNS

The most usual type of horn is the vibrator type. The general principle of operation is the same as that of a vibrating coil or other vibrating machine which, as the diaphragm is vibrated, causes a break in the circuit through the contact points. This allows the diaphragm to return to its normal position and make contact through the contact points again, which immediately sets up a new surge of current to induce magnetism and start a second vibration.

The construction of the Buick Klaxon horn is illustrated in Fig. 23. The adjustments of individual horns, whether operated in pairs or separately, are quite similar in most respects. In the case

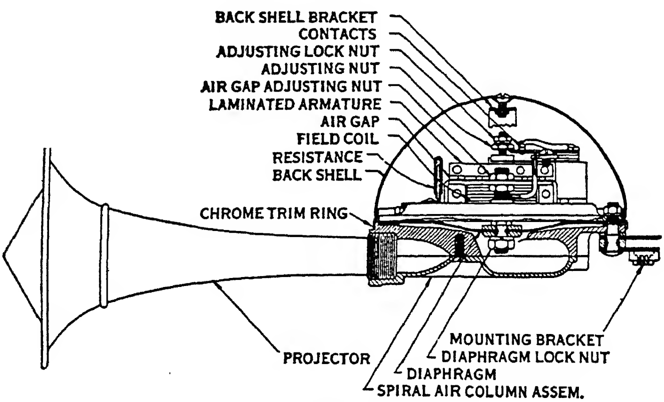

Fig. 23. Buick Klaxon Electric Horn

of the Buick horn, the left horn, which has a low pitch, is blended with the right horn, which has a high pitch. These horns, although operated electrically, produce a sound closely resembling that of an air horn. The sound frequency of the low note horn is controlled by a long air column and the high pitch horn by a short air column, part of which is formed by a spiral-shaped passage cast into the base of the horn.

Inasmuch as the total current required by both horns is approximately 24 amperes, horns are operated by a relay mounted on the generator alongside of the cutout relay and controlled by the horn button. There are two adjustments for the horn—the air-gap adjustment and the tone control.

Air-gap Adjustment. When adjusting the air gap, remove the horn back shell and check the air gap before proceeding with any adjustment. The gap should be uniform across the entire surface of the armature and should be .034 inch to .037 inch on the high note horn and .044 inch to .047 inch on the low note horn. The gap is regulated by means of the air-gap adjusting nuts.

Adjusting Tone. In adjusting the tone, first, disconnect one horn and connect an ammeter in series with the other horn. This can be done by clipping one of the ammeter wires to the terminal of the relay marked "battery" and the other to the terminal marked "horn." Use heavy wire, at least 10 gauge, and do not use any greater length than is absolutely necessary. Next, proceed to regulate the charging current by varying the engine speed until the voltmeter connected to the horn terminal and grounded part of the horn registers 6 volts, while the horn is blowing. Next, loosen the lock nut and turn the adjusting nut until the current consumed by the horn is 12 amperes. This needs to be registered on a high-grade instrument. The current can be decreased by turning the adjusting nut to the right and increased by turning it to the left. Increasing the current increases the volume. However, too much current will cause the horn to have a sputtering sound and may cause the horn to lock in cold weather. Adjustment is very sensitive and the adjustment nut should be moved not more than one-tenth of a turn at a time and locked in position for each test. Both horns are adjusted in the same manner. In case an ammeter is not available, the horns may be adjusted according to tone or sound.

After each unit has been adjusted separately and operated thus, the horns should be sounded together for a proper blend of tone. The armature of the low note horn is provided with weights for varying the frequency. Addition of one washer lowers the frequency and the removal of one washer raises the frequency of the horn. If a beat note is obtained, final adjustment for proper blend tone can be made by the removal or addition of one or more weight washers on the armature. Ordinarily it will not be necessary to disturb this adjustment. The frequency of the horns at rated voltage should be 400 to 410 cycles for the high note horn and 300 to 310 cycles for the low note horn.

Relay Adjustment. The point opening of the relay should be

.015 inch to .025 inch. The air gap with the points closed should be .012 inch to .017 inch. The relay, when adjusted properly, should close at 4 volts. The point opening can be changed by bending the brass stop which bears against the relay armature when the points are in the open position. The air gap can be adjusted by loosening the air-gap adjustment screws and moving the armature up or down. After the air gap and points have been properly adjusted, the proper voltage cut-in can be obtained by changing the spring tension, by bending up or down the brass support for the flat steel spring. Refer to Fig. 20 of the section on "Reading Wiring Diagrams."

NASH MECHANICALLY OPERATED WINDSHIELD WIPER

The windshield wiper is positive in its action, being driven by a gear on the camshaft, and through a flexible shaft. The end movement of the shaft controls the gear drive, which is controlled by a clutch. The drive unit is installed under the cowl and over the instrument group. The wiper arms are connected to shafts which project through the cowl and which in turn are driven by a worm gear and pin. The drive shaft, which moves longitudinally, is moved by the hand control against the pressure of the coil spring, and operates the clutch in the gear drive unit. If the wiper arms are prevented from moving, it may cause excessive load to occur on the driving mechanism. To prevent this from being damaged, a soft pin, one-fifth as strong as the cable, which connects the clutch and cable, shears off.

If wiper will not operate, examine the shear pin. Unscrew the lower coupling nut from the gear drive unit, and examine the shear pin which connects the lower end of the cable to gear shaft. If pin is not sheared, put the control in operating position, start engine and note if cable rotates. If cable does not rotate, the trouble is in gear drive unit, and it should be removed and replaced where necessary. If cable rotates, but wiper arms do not move, proceed as follows: If shear pin has sheared off and wiper fails to operate, put control handle in operating position, attach hand drill to lower end of drive cable, and operate wiper by revolving drill. If wiper operates with cable turning freely, install new shear pin and reconnect all parts. If cable resists turning, and wiper fails to operate when shaft is rotated by drill, trouble will be found in wiper-arm driving unit.

READING WIRING DIAGRAMS AND USING ELECTRICAL TEST EQUIPMENT

EXPLANATION OF WIRING DIAGRAMS

The first requisite in the work of electrical trouble shooting and repair work is the ability to trace a circuit on a wiring diagram. The wiring diagram is very useful both for rewiring work and for checking up correct connections in trouble shooting.

In the making of a wiring diagram, it would be a difficult task to write in the names of the different parts of the several pieces of electrical equipment. The manufacturers have compiled a number of symbols which are used to show these different parts. In Figs. 1 to 12 inclusive, are shown the symbols that are used in the Delco installation. While these symbols are standard for Delco only, they may be considered standard for all since they bear a close resemblance. These symbols should be carefully studied so that the different parts of the circuits can be easily recognized on sight. Switches, contact points, resistances, etc., are points at which trouble occur. If the repair man can find the part on the wiring diagram and trace the circuit on the diagram to the part, he can easily find the circuit on the car.

Current Direction. The plus and minus, or positive and negative signs, + positive, — negative, scarcely call for any extended explanation. They indicate the direction in which the current flows. It is of the utmost importance, where the manufacturers' directions are to connect certain apparatus with a given wire to the plus, or positive, side, and another wire to the negative, that these instructions be followed explicity. Otherwise, the apparatus either will refuse to work or it may be damaged, as in the case of a storage battery on which the connections have been reversed. Wherever it is necessary that the current flow through a piece of apparatus in a certain direction, the manufacturer stamps plus and minus signs at the terminals.

+ Positive

— Negative

Fig. 1. Battery, Either Storage or Dry Cells

Fig. 2. Generator, Commutator, and Brushes

Fig. 3. The Proper Method of Showing a Coil Which Surrounds an Iron Core

Fig. 4. The Method Used in Showing a Coil Where There Is No Chance of Confusion—Used in Field Coils, Ignition Coils, Etc.

Fig. 5. The Method Used to Show Resistance Such as a Resistance Unit and Charging Resistances

Fig. 6. Ground Connection Where the Wire Is Connected to the Chassis, Engine, or Generator

Fig. 7. Contact Points Such as in Switches, Distributors, Etc.

Fig. 8. Method Used to Show Lighting Switches

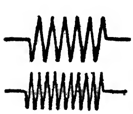

Fig. 9. Primary and Secondary Windings of an Ignition Coil

Fig. 10. Condenser

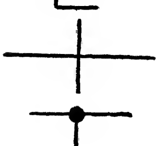

Fig. 11. Upper Showing Crossed Wires not Connected. Lower Showing Connection in the Wiring

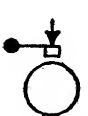

Fig. 12. Motor Commutator and Brushes with Brush Lifting Switch

Battery; Generator. A battery, regardless of its type, is always shown by alternate heavy and light lines, as indicated in Fig. 1, each pair of lines representing a cell, so that the number of cells in the battery may be told at a glance. Other sources of current, such as generators, are indicated by a conventional sign consisting of a circle with two short heavy lines tangent to its circumference at opposite points and usually at an angle to the horizontal, as shown in Fig. 2. The origin of this sign will be apparent in its resemblance to the end view of a commutator with a pair of brushes bearing on it. This sign is also used to indicate a motor, in which case the letter **M** is inserted in the circle.

Coils. Coils which are wound on an iron core are generally indicated by a conventional sign consisting of a few loops of wire, as in Fig. 3, but this is only the case where such a coil occurs at a place in the circuit where there might be a chance of confusion in identifying it. Where there is no possibility of confusion—as in the case of the windings of a generator or motor, ignition coils, and the like—the sign shown in Fig. 4 is often used. Where the lines are heavy, a coarse wire, such as is employed for series windings of generators or motors, or the primary winding of an ignition coil, is intended.

Resistance. Resistance in a circuit is usually shown by an arbitrary sign, Fig. 5, similar in outline to a piece of the cast-iron grid frequently used in charging resistances, though sometimes shown as a coil and marked "resistance".

Grounds. The sign of a ground connection is the inverted pyramid of short lines, Fig. 6, and indicates that the circuit is grounded. This may be either by a wire directly connected at some point with the frame, as in the case of the storage battery, or it may be through an internal ground connection in the apparatus itself, as in the lamps and sometimes the generator or motor, the connection being made simply by fastening them in place. In any case, the sign indicates that the circuit is completed through a ground.

Contacts. There are a number of signs employed to indicate contact points, switches, and the like, and, where they are not of an arbitrary character, such as Fig. 7, which shows contact such as used in switches, distributors, etc., and Fig. 8, which indicates a lighting switch (Delco diagrams), they usually will be found to

bear sufficient resemblance to the apparatus itself to make their identification easy.

Induction Coil. Fine lines indicate a generator shunt winding, the secondary of an ignition coil, or the coil of a relay or cut-out. The primary and secondary windings of an induction coil as used for ignition are indicated by a fine and a coarse coil sign, as in Fig. 9.

Condenser. A condenser with its overlapping plates is shown in Fig. 10.

Crossed Wires. To show wires that cross one another without making connection, a straight-line cross is made at that point to show that the wires do not touch, as in Fig. 11, while wires that are connected are shown by a black dot at the junction.

General and Special Usage. While these signs are not universally used in exactly the form shown here, their employment is very general and in the majority of cases, such as the positive and negative, battery, ground, generator, induction-coil windings, and coil signs, they are never changed. In some instances special signs are employed, such as that shown in Fig. 12, which indicates the motor commutator of the Delco single-unit machine or *dynamotor,* and shows the special brush lifting switch. Incandescent lamps are almost always indicated by small circles, though the lamp itself is sometimes drawn in. As a matter of fact, very little system is followed by different makers in making these wiring diagrams. In an effort to simplify its reading to the uninitiated, a diagram will sometimes picture most of the apparatus in such form that it will be recognized from its resemblance to the original, including the battery, generator, lamps, and the like, using only signs for showing coils and ground connections; others go to the opposite extreme and show nothing but signs.

Some examples of changes in convention in illustrating different features of wiring appear in Fig. 13, the Chevrolet car wiring diagram. In this case it will be noted that the two wires are joined without any dot at the juncture to show that they are tied together, while wires which cross each other are shown as crossing by means of a conventional loop or hopover. These points are illustrated by the wire which runs from the horn to the lighting switch, and is joined with another lead running over to the generator. The Buick wiring diagram, Fig. 17, shows the juncture of two wires with a dot at their juncture, and also makes use of the hopover where two wires cross

without joining. These features are used in current wiring diagram drawing practice.

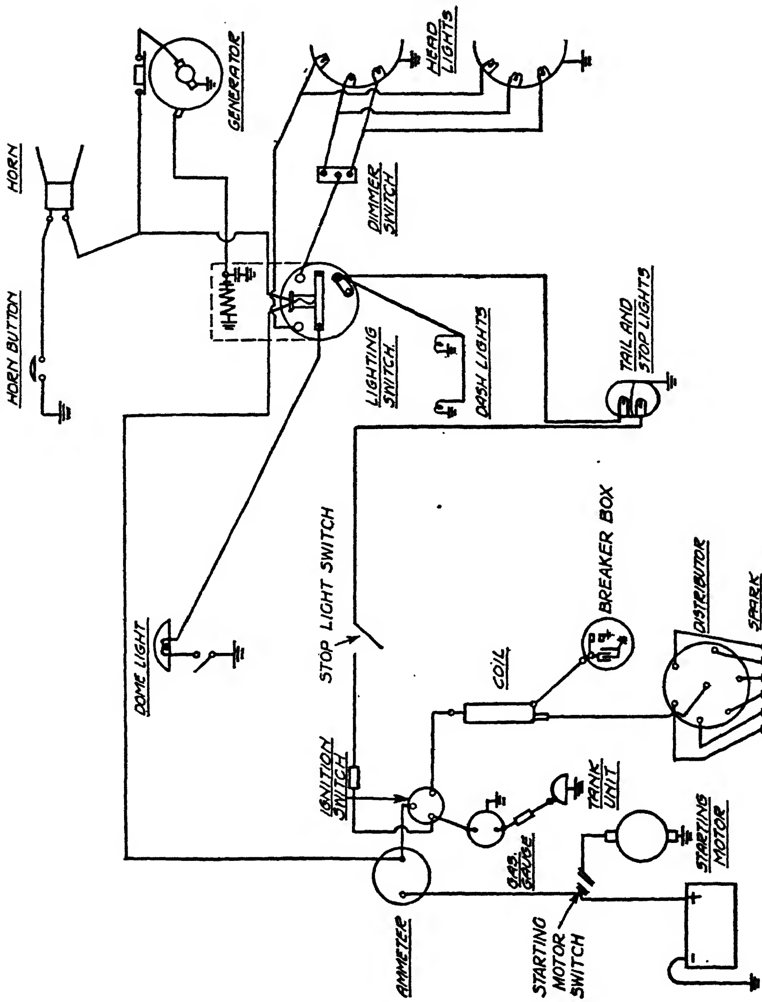

Fig. 13, Chevrolet Car Wiring Diagram

Car Circuits. The most usual circuits of the passenger car are the starting motor, the generator, and the ignition circuit, which are shown combined in Fig. 13, and separately in Figs. 14, 15, and 16. Aside from these circuits there are also the horn circuit, the light

circuit and the gasoline tank-gauge circuit. If there is a radio installation of course there is the radio circuit which in itself is very complicated.

The starting motor, generator, and ignition circuit shown in Figs. 14, 15, and 16, may be picked out in Fig. 13, where they are shown combined in one diagram. The student will notice of course that the

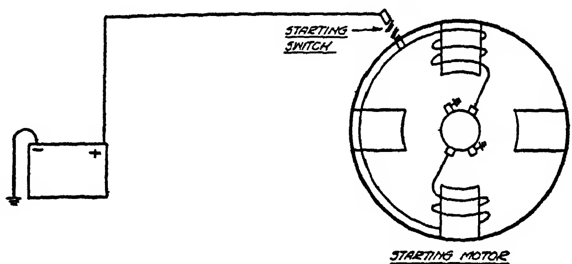

Fig. 14. Chevrolet Starting Motor Circuit

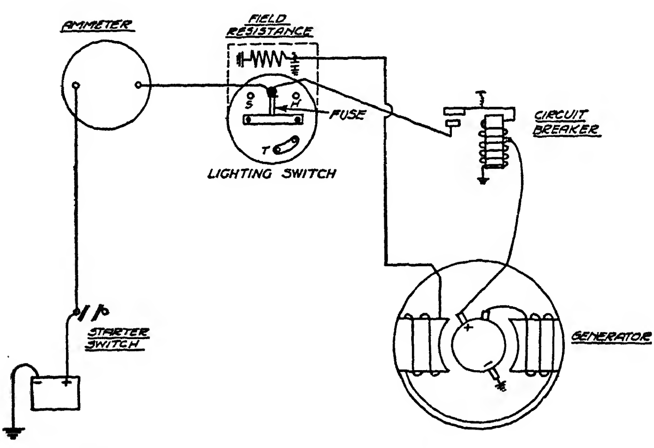

Fig. 15. Chevrolet Generator and Charging Circuit Diagram

combination is not exactly the same for the separate units. However, it must always be kept in mind that when laying out a wiring diagram no thought is given to the lengths of wires or the relative position of the different units. Irrespective of where an electrical unit may be located on the car, the wiring diagram is designed to show only the circuit which supplies that particular unit. The all-important thing

in studying a wiring diagram is to note where the wires or electrical leads are connected to the different units.

Internal Circuits. Wiring diagrams do not always show the internal circuits of the different units. For instance the generator in Fig. 13 shows two brushes running to the commutator, a wire lead running off from one of the brushes to the circuit breaker or the relay on the top of the generator, and the other lead grounded. The same generator is illustrated in Fig. 15 somewhat differently, inasmuch as it has the internal circuit shown in more detail.

Tracing the Circuit. The ability of the auto-electrician to trace the circuit on the wiring diagram is all important, inasmuch as this

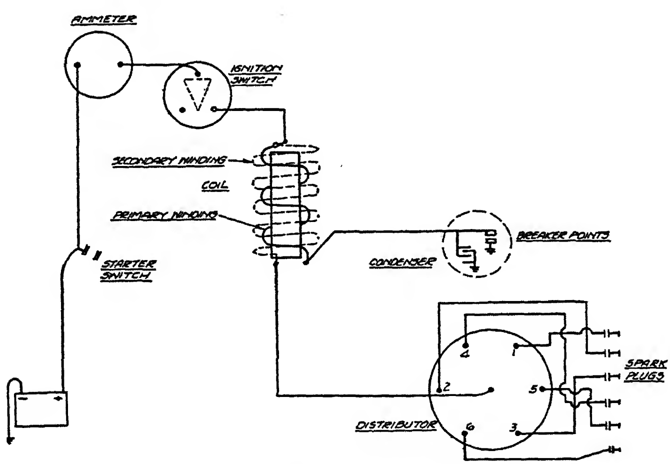

Fig. 16. Chevrolet Ignition Wiring Diagram

is necessary if he is to locate trouble in the wiring system. In many instances the wires which conduct the current are concealed and hidden away so that only their ends are available. The ability to trace out these wires and to determine where they lead and what they serve, is a test of skill and knowledge. In many car wiring systems, certain colors of wires are used. These are called tracer markings. That is, if a red wire takes off from the generator and is found again connecting up to the ammeter, it is taken for granted that it is the same wire, and thus the circuit is identified. Another wire may be marked with a different color or a tracer thread in its cover. This idea is illustrated in Fig. 17 of the Buick "60" car

wiring diagram. The size of the wire and the markings of the separate wires are indicated on the diagram.

One of the simplest circuits to trace out is that of the starting motor as illustrated in Fig. 14. Here it will be noted that the negative side of the battery is grounded and the positive side is connected directly to the starting switch, from which point, when the switch is closed, current follows to the starting motor field winding, pässes through the two brushes connected to the field winding, on to the commutator and from the commutator through the commutator windings and finally is grounded on the two grounded brushes.

In the case of the generator circuit illustrated in Fig. 15, the circuit goes from the negative side to the ground. From the positive side it goes to the starter switch and from that point a lead is taken off to the back of the ammeter. After passing through the ammeter it is conducted to the lighting switch, from which point it is, of course, distributed as needed through the several circuits not shown here. From the lighting switch a lead is run to one of the contact points of the circuit breaker, which is shown open. When the automobile is started, operating the generator builds up a field voltage and this in turn has the effect of exerting an electro-magnetic pull on the movable arm of the circuit breaker relay. This is shown above the generator. This has the result of closing the contact points and when they are closed the current will proceed to flow through the contact points to the lighting switch and thence to the ammeter. The current drawn by the lights will not be registered on the ammeter as passing through it to charge the battery. What does happen is that the ammeter shows a falling off of charge because of the amount of current going to the lights. The difference then, between the maximum charging rate without lights and the lowered rate with lights, is the amount which is going to the lights.

When making a study of the ignition circuit as shown in Fig. 16, it will be noted that the path of the current from the battery to the ignition switch is similar to that of Fig. 15, representing the generator circuit. In the case of the ignition wiring diagram, there are in reality two separate circuits, one of these being the secondary or high-tension circuit and the other being the primary winding or primary circuit. In this wiring diagram again we see the conventional use of the condenser illustration.

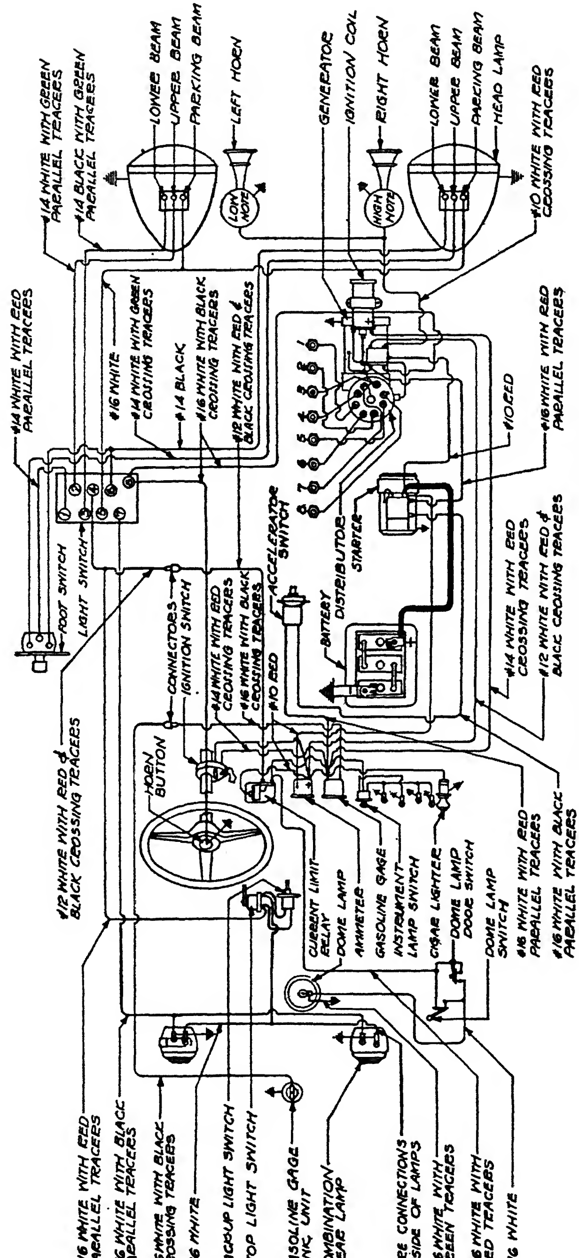

Fig. 17. Buick Series "60" and "90" Wiring Diagram

TESTING WIRING

Testing Electric Circuits of the Car. Fig. 17 illustrates the Buick wiring diagram. Figs. 18, 19, and 20 illustrate the use of

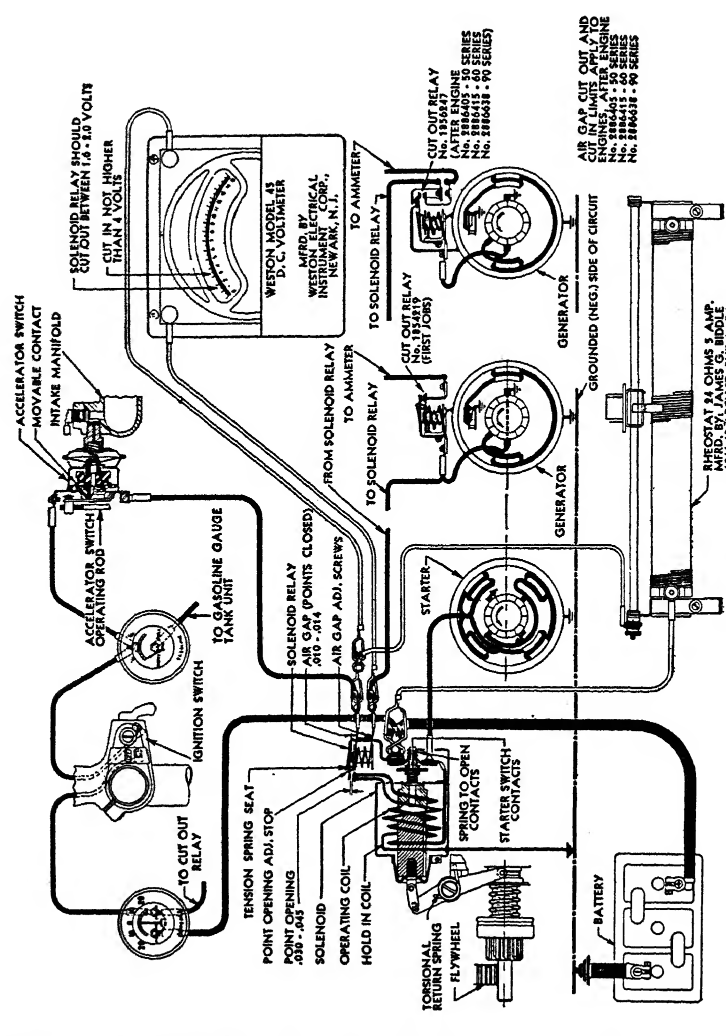

Fig. 18. Diagram for Checking Calibration of Buick Solenoid Relay

instruments in checking up on the different circuits of the car wiring. Fig. 18 shows the diagram for checking the calibration of the Buick solenoid relay. In the upper right-hand corner of the diagram a low-reading voltmeter with a scale of 0 to 10 volts, with graduations of

$^1/_{10}$ volt is shown. In the lower right-hand view of the diagram a 24-ohm variable rheostat, having a capacity of 5 amperes is shown.

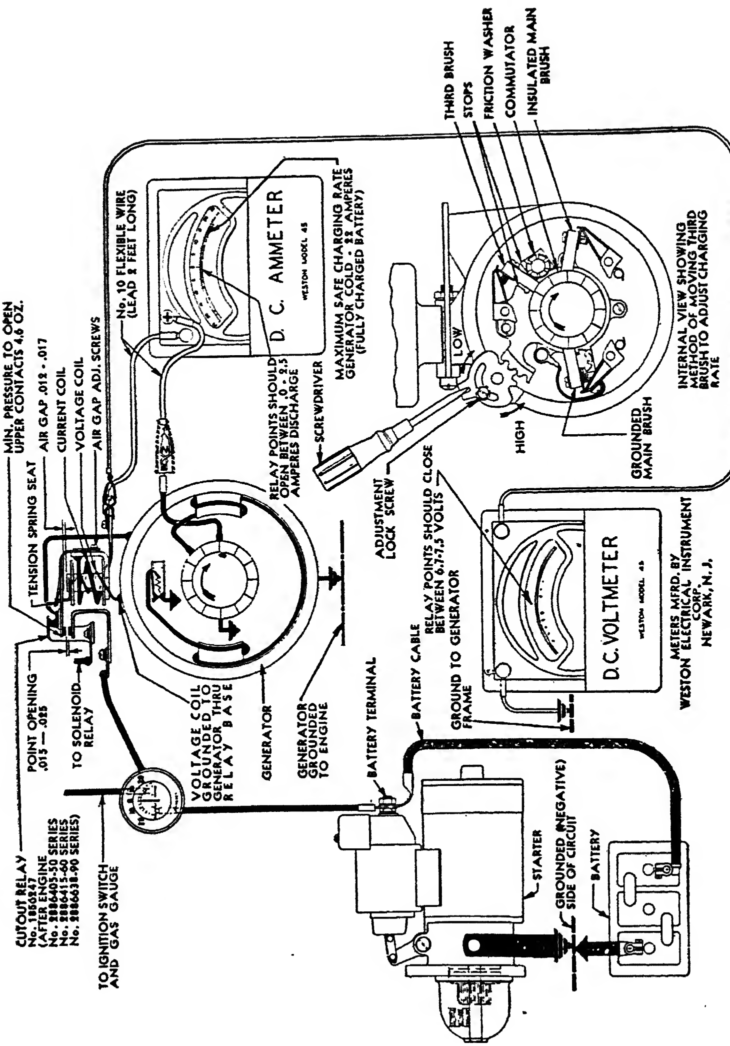

Fig. 19. Diagram for Checking Buick Generator Charging Rate and Relay Operation

When determining the cut-in voltage make sure that the ignition is turned off and then connect the lead from one end of the rheostat to the battery cable terminal on the solenoid. Next connect the wire from the adjustable side of the rheostat to the terminal on the sole-

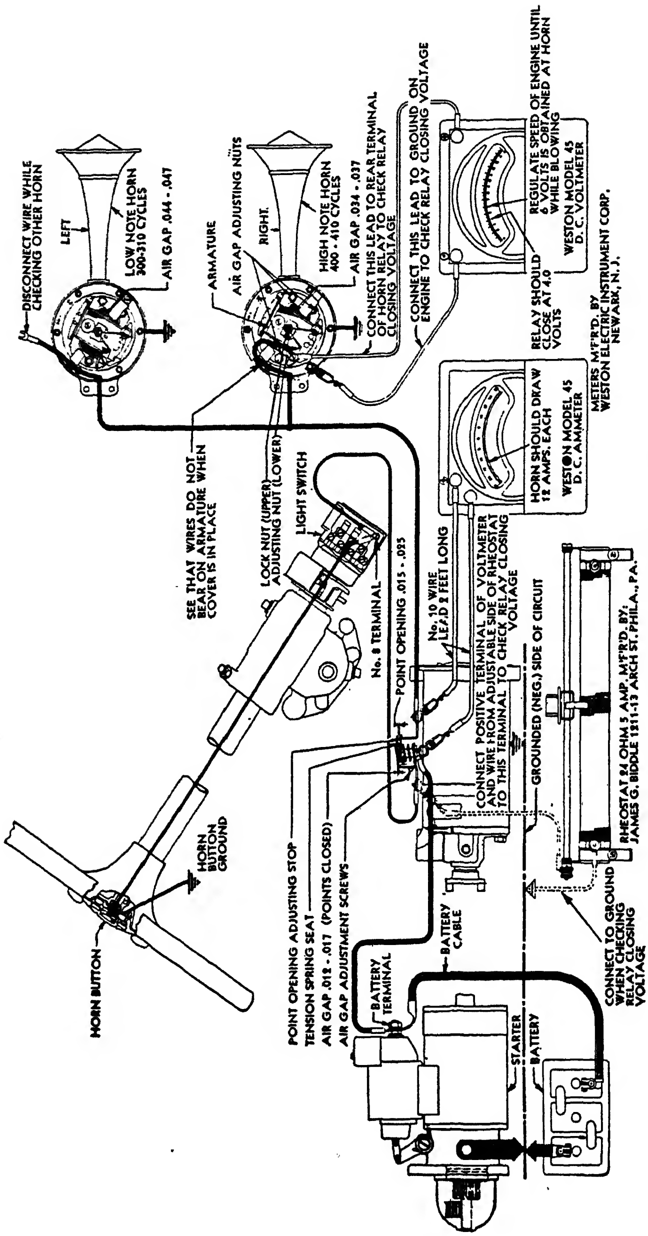

Fig. 20. Diagram for Checking Buick Horns

noid relay which is connected to the accelerator switch. This is the terminal having a white wire with black parallel tracers connected to it. Next connect the voltmeter leads to the relay terminals which are connected to the accelerator switch, and ground the contacts on the cut-out relay.

Move the rheostat slowly, decreasing the resistance until the engine starts to crank. This indicates the cutting-in of the relay without removing the cover. The voltage required should come within the limits for the particular engine serial number being worked on. Ordinarily the cut-in voltage is from 3.2 to 4 as a maximum. The opening voltage is from 1.5 to 2 as a maximum.

When determining the opening voltage, it is necessary to continue to adjust the rheostat until all resistance is cut out, so that the full voltage is applied to the relay. This will fully saturate the magnet core. Gradually increase the resistance until the starter discontinues cranking. The voltage indicated at this instance will be that required for the relay contact points to open.

The above rather intricate instruction is given in order that the student may understand the great degree of exactitude required for checking electrical equipment. Another example of this type of test is given below.

Checking Buick Charging Rate. The generator should start charging at car speeds of from 8 to 10 miles per hour and reach its maximum at approximately 25 miles per hour. Under normal conditions a maximum of eighteen amperes should be satisfactory. However, during extremely cold weather it may be desirable to increase the output to 20 amperes as indicated by the dash ammeter.

The generator output should be adjusted accurately, therefore it is best not to rely upon the dash ammeter, but to insert a test ammeter of known reliability between the wire coming out of the generator frame and the cut-out relay, as shown in Fig. 19. The generator output indicated on the meter placed in this portion of the circuit will be approximately 2 amperes higher than the dash ammeter, providing the dash ammeter is correct, inasmuch as it is not affected by the ignition current, which does not pass through the car ammeter circuit.

The ammeter is shown connected in the upper portion of the view, Fig. 19, while in the lower right-hand corner a diagram is

shown of the method of using a screw driver to move the brush rigging and secure a different charging rate. Moving it in the one direction will give a higher rate, and in the opposite direction a lower rate, as indicated by the arrows in this portion of the diagram.

Checking the Buick Horn Circuit. Fig. 20 illustrates the method of introducing the Weston DC ammeter and the Weston Model 45, DC voltmeter to the horn circuit, in order to check its operation. Detailed information regarding this check-up is given in the section on car lighting and warning signals. It will not be repeated here but the student should refer to that section for further details.

Locating Grounds. By referring to any of the wiring diagrams of the one-wire type, it will be noted that certain parts of the circuits are normally grounded, i.e., they are connected to the common return represented by the chassis of the car. For example, the negative battery terminal, one terminal of each lamp, one motor, one generator brush, one timer contact, one terminal of the horn push button, and one terminal of the condenser in the coil are grounded. Before testing the wiring for grounds, it will be necessary to remove these normal, or intentional, grounds. This is carried out, in the order in which they are mentioned, by disconnecting the negative battery lead and removing all the lamps, placing a piece of cardboard between each generator and each motor brush, including the third brush of the former and the commutator against which it ordinarily bears, disconnecting the leads from the horn button and from the distributor, and raising the base of the ignition coil so that it is insulated from the top cover of the generator motor. The system will then be in the condition shown in Fig. 21.

One of the test points is then placed on the frame of the car and the other point on the negative terminal *A* of the battery. If the lamp lights, it will indicate a ground somewhere on the switch or in the motor windings (all of the switch buttons being pushed in). Then, with one test point still grounded on the frame of the car, test with the other point the different terminals of the combination switch. If the lamp lights during this test, it will indicate a ground.

Locating Shorts. To test for short-circuits between wires that are normally insulated from each other, place one test point on the end of one wire and the second test point on the end of the other, as shown in Fig. 22. If the lamp lights, it will indicate a short-circuit

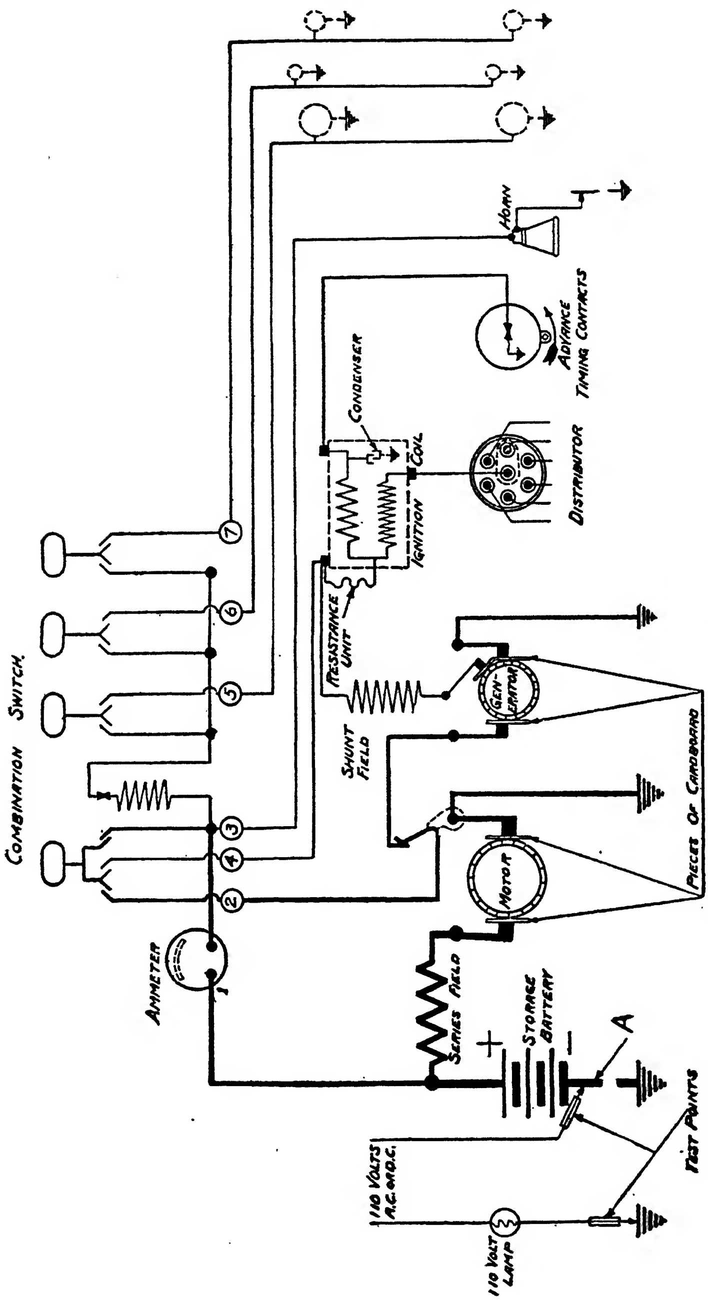

Fig. 21. Wiring Diagram Showing Method of Using Lamp-Testing Set for Locating Grounds

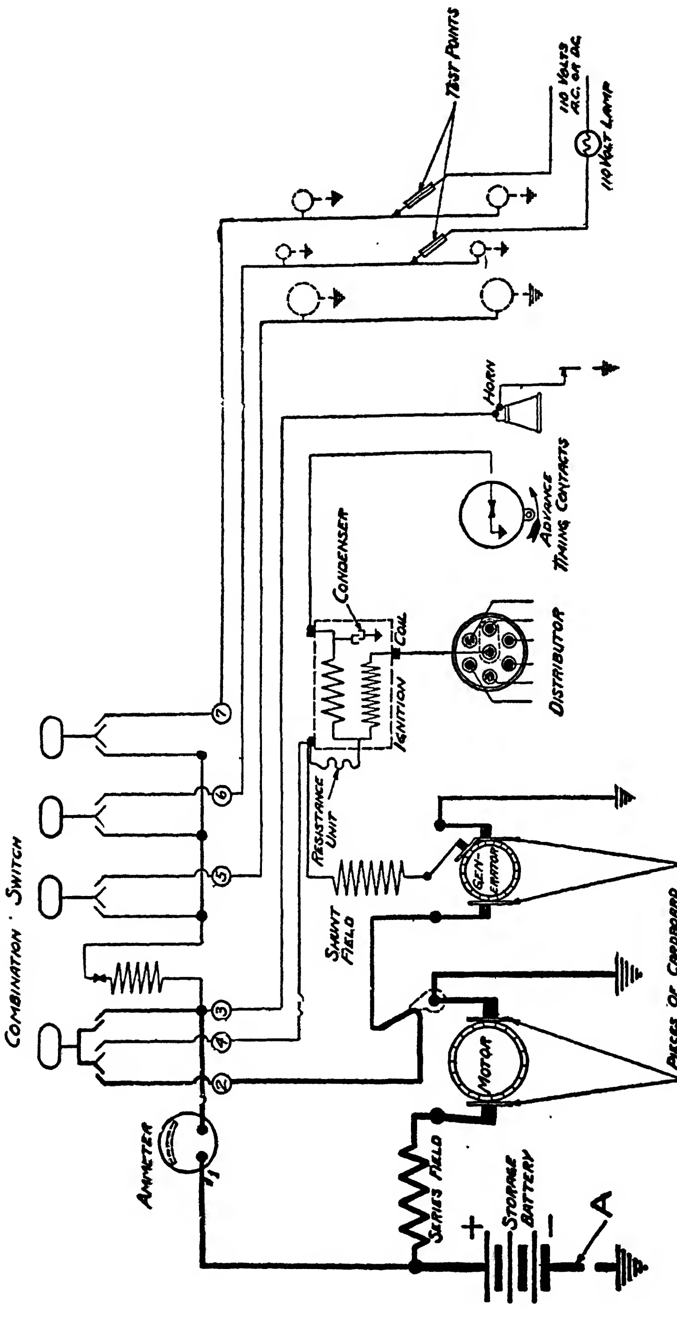

Fig. 22. Wiring Diagram Showing Method of Using Lamp-Testing Set for Locating Short-Circuits

between these two wires, which can then be carefully inspected to locate the exact position of the fault. Failure of the lamp to light when the test is made will indicate that the wires in question are in good condition; the tests can then be applied to other parts of the circuits which should be insulated from each other.

Locating Breaks in Wires. Where the failure of the apparatus in a particular circuit makes it apparent that a wire, or lead, may be broken, it may be tested by placing one of the points on each end of the wire in question. The lighting of the lamp will indicate that there is a complete circuit through the wire, while its failure to light is evidence of a break in the wire. If at all difficult to locate the break, the easiest method of repairing is it to replace the wire with a new lead of the same size and type of insulation. The method of carrying out this last test is illustrated in Fig. 23 and it is naturally applicable to any of the wires, not only of this type of installation but of any other lighting and starting system. In making this test, care must be taken not to apply the points at places on the terminals where a ground connection will result, as this will complete the circuit through the lamp without the current passing through the wire supposedly under test. This method of locating grounds, short-circuits, or open circuits will be found much better than the use of a buzzer, bell, or magneto, and it is recommended wherever a 110-volt current is available. However, where it is not available, a lamp, bell, buzzer, or the portable voltmeter may be used in connection with the storage battery on the car, after detaching its usual connections to the system.

Ground in Starting or in Lighting 2-Wire Circuits. When the blowing of a fuse in any lighting circuit is due to a ground, or a similar fault is suspected in the starting system, it may be tested for either with the lamp outfit or with the low-reading voltmeter, as follows:

Disconnect one battery terminal, taping the bare end to prevent contact with any metal parts of the car, and connect one side of the voltmeter to this terminal. Attach a length of wire having a bared end to the other terminal of the voltmeter, as shown in Fig. 24. Connect the bared end of the free wire to some part of the car frame; making certain that good electrical contact is made. Disconnect the generator and starting motor completely, open all lighting switches, and be sure that the ignition switch is off. If there is no ground in the

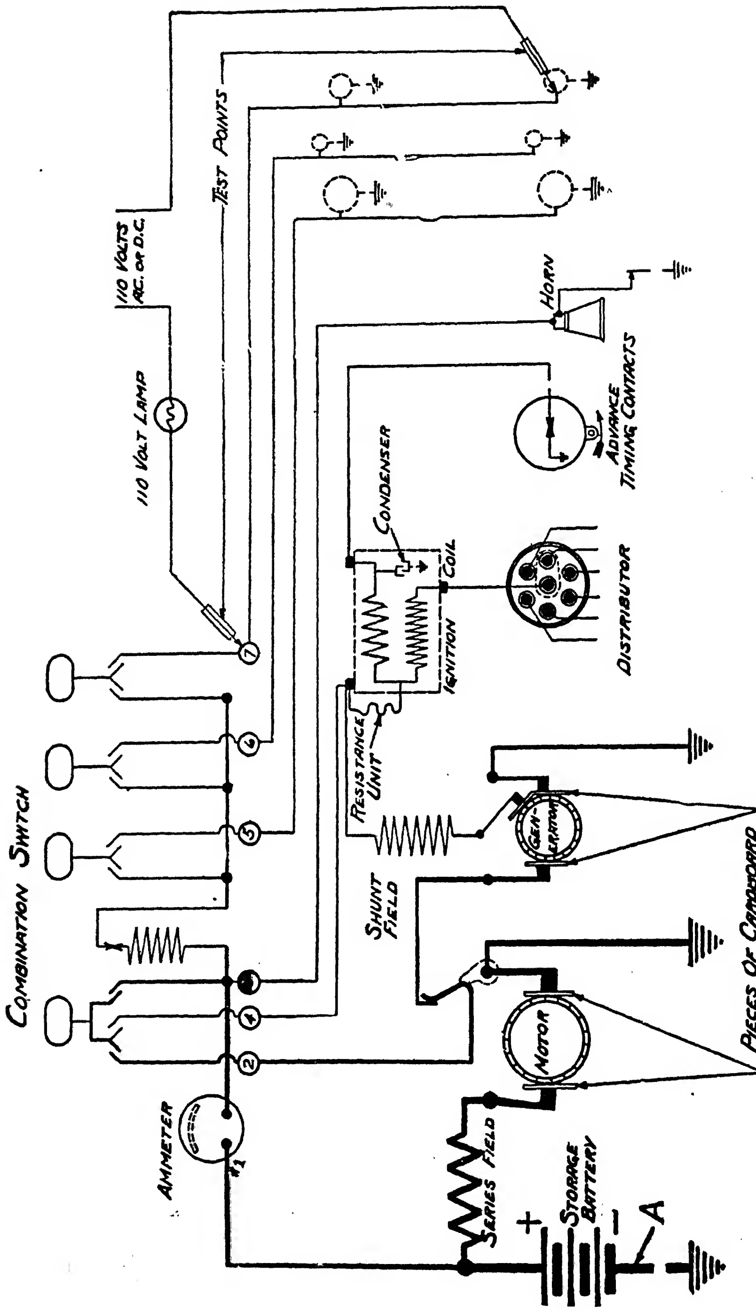

Fig. 23. Wiring Diagram Showing Method of Using Lamp-Testing Set for Discovering Breaks in Wires

circuit, the voltmeter will give no indication. Be sure that none of the disconnected terminals are touching the engine or frame; to insure this, tape them.

Should the voltmeter give a reading of 4 volts or more, it indicates that there is a ground in the wiring between the battery and the junction box, or in the wiring between the junction box and the generator or the starting motor. If the voltmeter reads less than 4 volts but more than ½ volt, all wiring and connections should be carefully inspected for faults. This test should be repeated by reversing the connections, that is, by reconnecting the wires on the side of the battery circuit that has been opened and disconnecting the other side.

Localizing Any Ground. To localize any fault that the reading of the voltmeter may show, reconnect the wires to the starting motor

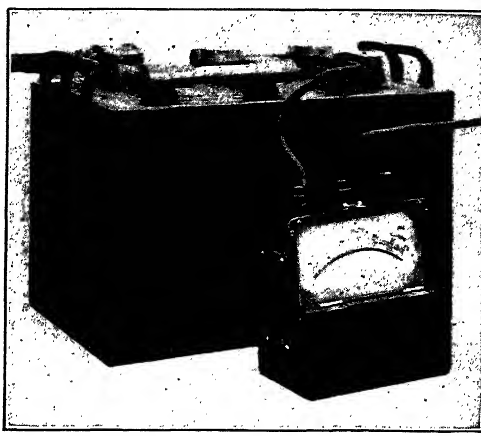

Fig. 24. Testing for Grounds with Voltmeter in Two-Wire System

and close the starting switch; any reading of the voltmeter with such connections will indicate that the ground is in this circuit. Should no ground be indicated with these connections, disconnect the starter again and reconnect the generator; if the voltmeter records any voltage, the ground is in the generator circuit. With both starter and generator disconnected, the voltmeter being connected first to one side of the battery and then to the other, operate the lighting switches, the ignition switch, and the horn, one at a

time, and note whether the voltmeter needle moves upon closing any of these switches. A voltage reading upon closing any of these switches will indicate a ground in that particular circuit.

Short-Circuit Tests. To test for short-circuits, substitute the ammeter for the voltmeter, but do not connect the instrument to

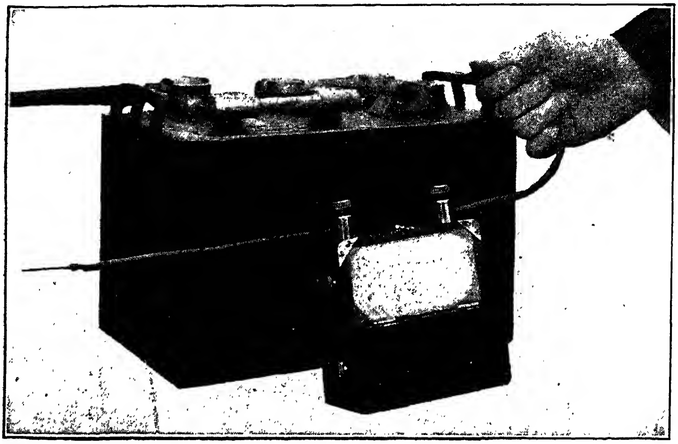

Fig. 25. Testing for Short-Circuits with Ammeter in Two-Wire System

the battery. The shunt reading to 20 amperes should be employed, one side of the ammeter being grounded on the frame as previously described, and the other being connected with a short wire that can be touched to the open side of the battery, Fig. 25. Disconnect the starter and the generator and open all the switches, then touch the bare end of the wire to the battery terminal on the open side as shown. Any reading, no matter how small, will indicate a short-circuit (two-wire system) in the wiring between the battery and junction box or between the latter and the starter, or generator. If the ammeter reading shows a heavy current, there is a severe short-circuit.

Localizing a Short-Circuit. The short-circuit may be localized in the same manner as described for the voltmeter test, i.e., connect the starter and test; disconnect the starter, connect the generator and test. A reading on the generator test may be due to the contacts of the cut-out sticking together. If the cut-out contacts are open and the ammeter registers, there is a short-circuit in the generator windings.

Disconnect the generator again, remove all the lamps from the sockets, and turn on the lighting-circuit switches one at a time, touching the wire to the battery terminal after closing each switch. A reading with any particular switch on indicates a short-circuit in the wiring of the lamps controlled by that switch. Only one switch should be closed at a time, all others being open. This test should be made also with the ignition switch on but with the engine idle. The ammeter should then register the ignition current, which should not exceed 4 to 5 amperes. If greater than this, the ignition circuit should be examined.

Cautions. Do not attempt to test the starter circuit with the ammeter as it will damage the instrument. To test the starter circuit, reconnect as for operating, removing the ammeter. Close the starting switch; a short-circuit in the wiring will result either in failure to operate or in slow turning over of the engine. See that the switch parts are clean and that they make good contact. If the short-circuit is in the winding of the starting motor, there will be an odor of burning insulation or smoke.

The battery must be fully charged for making any of these tests. While the effect either of a ground or of a short-circuit will be substantially the same, its location and the remedy will be more easily determined by ascertaining whether it is the one or the other.

Lamp Troubles. When short-circuits, grounds, or open-circuits are suspected as the cause for lights failing to burn, it is advisable to examine the different lamps in the system before starting to test or to pull out any of the wiring. In the single-wire or grounded system, the circuit is completed by grounding the lamp through the reflector. They often become rusted or dirty, failing to make good electrical contact and the lamp will not light. The lamp sockets may become rusted or dirty with the same result and the wires will break inside the lamp causing an incomplete connection. The plunger springs in the sockets may get weak, making poor connection, and the socket will have to be renewed. Cleaning and making good connections will often cure other troubles.

WIRING DIAGRAMS AND DATA SHEETS

CHART OF ABBREVIATIONS

GENERAL

Amps.—Amperes
V.—Volts
C.P.—Candle Power
R.& L. of Firing Order—Right and left determined from driver's seat
Max. Chg. Rate—Maximum Charging Rate
R.P.M.—Revolutions per Minute
D.C.—Double Contact
MM.—Millimeters
Side Lights—Side or Parking Lights
Air Gap—Contacts Closed
Oil—Oil Ring
Comp.—Compression Ring

IGNITION AND VALVE TIMING

B.T.D.C. or B.T.C.—Before Top Dead Center
B.B.D.C. or B.B.C.—Before Bottom Dead Center
A.B.D.C. or A.B.C.—After Bottom Dead Center
A.T.D.C. or A.T.C.—After Top Dead Center
T.D.C. at Retard—Top Dead Center; Spark Control Retarded
12° past T.D.C.—Piston 12° past T.D.C. Spark Control Retarded
2½" before T.D.C.—Piston 2½", on Flywheel, before T.D.C.
"Ret" at Retard—Marks "Ret" on Flywheel

LUBRICATION SYSTEM

Gals.—Gallons
Qts.—Quarts
Press.—Pressure to Main Bearings
Splash—Pressure Circulating Splash
Splash—Connecting Rod Dips

REAR AXLE

Semi—Semi-Floating
¾ Flt.—Three-quarters Floating
Full Flt.—Full Floating

CLUTCH

Disc.—Multiple disc, either wet or dry
Plate—Single or Double Plate Type

BRAKES

Front—Front Wheels
Rear—Rear Wheels
Hand—Hand Brake
Trans.—Transmission Brake

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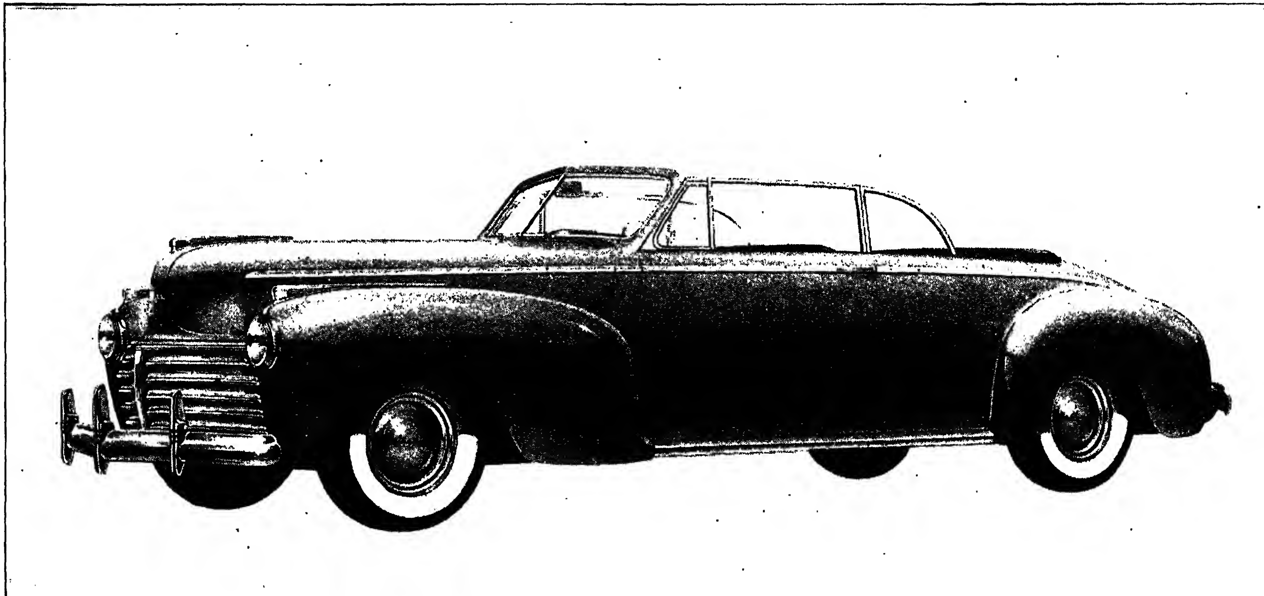


1941 CHRYSLER NEW YORKER CONVERTIBLE COUPE
Courtesy of the Chrysler Corporation

Auburn **Model 6-54, 6-Cylinder** **Year 1936**

Battery U.S.L. **Type** **Volts 6** **Amps. 90**
Frame Connection Positive

Lighting **Head Lights**
Stop Light **Tail**
Parking Lights

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 16.3 Amps. **Speed** 2050 R.P.M.
Regulation **Cut-in** 7 Volts
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .018″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 3° B.T.C. Retard

Engine **Bore** 3 1/16″ **Stroke** 4 3/4″ **Taxable H.P.** 22.51
Piston Ring—Width Oil 1—1/8″, 1—3/16″ **Comp.** 1/8″
Diam. 3 1/16″ **Gap** .013″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 7.5° B.T.C. **Close** 37.5° A.B.C.
Intake Clearance .010″ Hot
Exhaust Timing—Open 50° B.T.C. **Close** 5° A.T.C.
Exhaust Clearance .010″ Hot

Carburetor Stromberg EX22

Steering Caster 3½° Camber 2½° Toe-in 1/8″

Cooling System Pump **Type** Centrifugal **Capacity** 16 Qts.

Clutch Long **Facings** Moulded 5 3/4″ x 9″ x .137″ 2 Required

Gear Ratio 4.4 to 1 Spiral Gears

Axle Columbia Semi-Floating

Brakes Bendix Hydraulic
Front 24 9/32″ x 1½″ x 3/16″ Clearance .010″
Rear 24 9/32″ x 1½″ x 3/16″ Clearance .010″
Hand Rear Service
Lining Moulded

Auburn **Model 8-52, 8-Cylinder** **Year 1936**

Battery U.S.L. **Type** **Volts** 6 **Amps.** 105
Frame Connection Positive

Lighting **Head Lights**
Stop Light **Tail**
Parking Lights

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 16.3 Amps. **Speed** 2050 R.P.M.
Regulation **Cut-in**
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .018″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing 3° B.T.C. Retard

Engine **Bore** 3 1/16″ **Stroke** 4 3/4″ **Taxable H.P.** 30.00
Piston Ring—Width Oil 1—1/8″, 1—3/16″ **Comp.** 1/8″
Diam. 3 1/16″ **Gap** .013″
Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** 7.5° B.T.C. **Close** 37.5° A.B.C.
Intake Clearance .010″ Hot
Exhaust Timing—Open 50° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .010″ Hot

Carburetor Stromberg EE1

Steering Caster 2° Camber 1 1/2° Toe-in 1/8″

Cooling System Pump **Type** Centrifugal **Capacity** 20 Qts.

Clutch Long **Facings** Moulded 5 1/2″ x 9 3/4″ x .137″ 2 Required

Gear Ratio 4.08 to 1 Spiral Gears

Axle Columbia Semi-Floating

Brakes Bendix Hydraulic
Front 24 9/32″ x 2″ x 3/16″ Clearance .010″
Rear 24 9/32″ x 2″ x 3/16″ Clearance .010″
Hand Rear Wheels

Lining Moulded

Auburn Models 6-52-X and Y Year 1934

Battery U.S.L. **Type** RN-15A **Volts** 6 **Amps.** 90

Frame Connection Positive

Lighting

Head Lights 6-8, 32-21 C.P.

Dash, Tail and Stop 6-8, 21-2LH-3RH C.P.

Side Lights 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 20 Amps. **Speed** 2300 R.P.M.

Regulation 3rd Brush **Cut-in** 6.75-7.5 Volts

Relay Air Gap .010″-.030″ **Contact Gap** .025″-.035″

Ignition **Contact Breaker Gap** .018″-.020″

Spark Plug—Size 14 MM. **Gap** .025″

Firing Order 1-5-3-6-2-4

Timing 3° B.T.C.

Bore 3$\frac{1}{16}$″ **Stroke** 4$\frac{3}{4}$″ **Taxable H.P.** 22.51

Piston Ring—Width Oil 2—$\frac{1}{8}$″ Comp. 2—$\frac{1}{8}$″ **Diam.** 3$\frac{1}{16}$″
Gap Oil .006″-.012″ Comp. .010″-.018″

Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 40° A.B.C.

Intake Clearance .006″-.008″ Hot

Exhaust Timing—Open 50° B.B.C. **Close** 10° A.T.C.

Exhaust Clearance .006″-.008″ Hot

Carburetor Carter 288-S

Cooling System Centrifugal **Type** Pump

Clutch Long **Facings** Moulded 5$\frac{3}{4}$″ x 9″ x .137″ 2 Required

Gear Ratio Spiral Gears

Axle Columbia Semi-Floating

Brakes Bendix Hydraulic

Front 1$\frac{1}{2}$″ x $\frac{3}{16}$″ Clearance .010″

Rear 1$\frac{1}{2}$″ x $\frac{3}{16}$″ Clearance .010″

Hand Rear Service

Lining Moulded

Auburn **Model 8-101** **Year 1933**

Battery U.S.L. **Type** XY-15X-6A **Volts** 6 **Amps.** 104
Frame Connection Positive

Lighting Double Contact **Head Lights** 6-8, 32-32 C.P.
Double Contact **Stop Light** 6-8, 21 **Tail** 3 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 9-12 Amps. **Speed** 1800-2000 R.P.
Regulation 3rd Brush, Thermo. **Cut-in** 600 R.P.M.
Relay Air Gap .012″-.017″ **Contact Gap.** 015″-.025″

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 7/8 S.A.E. **Gap** .020″-.025″
Firing Order—1-6-2-5-8-3-7-4
Timing Std. Comp. 12-1/2° B.T.D.C. Piston .0702″ Adv.

Engine **Bore** 3″ **Stroke** 4-3/4″ **Taxable H.P.** 28.80
Piston Ring—Width 3-1/8″, 1-3/16″ **Diam.** 3″ **Gap.** .006″
Oiling—Type Pressure **Capacity** 8 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 40° A.B.C.
Intake Clearance .010″ Cold
Exhaust Timing—Open 50° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Stromberg Model URO—Updraft

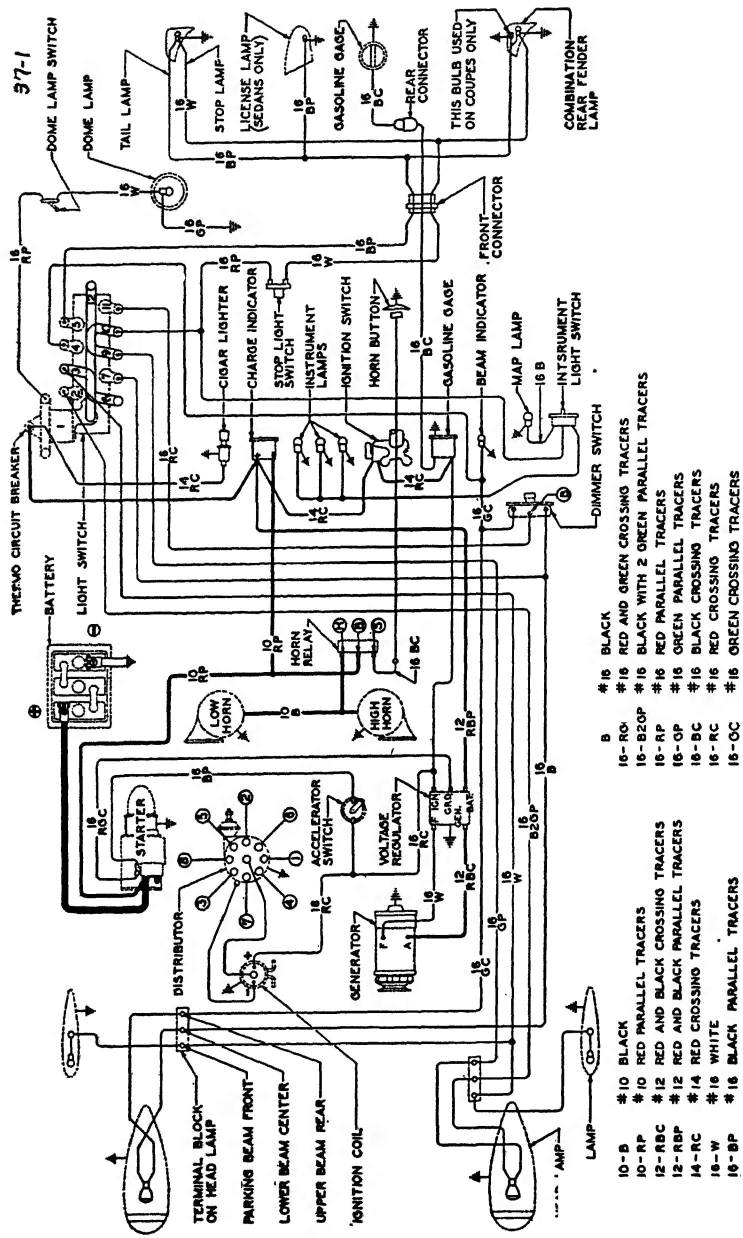
Cooling System—Centrifugal **Type** Pump **Capacity** 4-3/4 Gals.

Clutch Long **Facing**—Moulded 9-3/4″ x 5-1/2″ x .137″

Gear Ratio Ring Gear 47 Pinion 10 Spiral Gears

Axle Columbia Semi-Floating

Brakes Midland Mechanical
Front 33-3/4″ x 1-3/4″ x 7/32″ Clearance .040″
Rear 33-3/4″ x 1-3/4″ x 7/32″ Clearance .040″
Hand All 4 Wheels
Lining—Moulded



BUICK WIRING DIAGRAM, 1937, MODEL

Courtesy of Buick Motor Company

Buick — Model 40 — Year 1937

Battery Delco-Remy **Type** **Volts** 6-8 **Amps.** 100

Frame Connection Negative

Lighting
- Mazda 2320-L — **Head Lights** 6-8, 32-21 C.P.
- Mazda 1154 — **Stop Light** 6-8, 21 C.P. — **Tail** 6-8, 3 C.P.
- Mazda 55 — **Parking Lights** 6-8, 1.5 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
- **Max. Chg. Rate** 28 Amps. Hot — **Speed** 4200 R.P.M., Arm.
- **Regulation** Voltage — **Cut-in** 6.5 Volts, 800 R.P.M.
- **Relay Air Gap** — **Contact Gap**

Ignition Delco-Remy
- **Contact Breaker Gap** .013″
- **Spark Plug—Size** 18 M.M. — **Gap** .022″
- **Firing Order** 1-6-2-5-8-3-7-4
- **Timing** 2° B.T.C. Spark Half Advance

Engine **Bore** $3\frac{3}{32}$″ **Stroke** $4\frac{1}{8}$″ **Taxable H.P.** 30.63

Piston Ring—Width Oil 2—$\frac{3}{16}$″ Comp. 2—$\frac{3}{16}$
Diam. [illegible]″ **Gap** Oil .010″ Comp. .010″

Oiling—Type Gear Pump **Capacity** 6 Qts.
Pressure 45 Lbs. @ 35 M.P.H.

Valves
- **Intake Timing—Open** 13° B.T.C. **Close** 68° A.B.C.
- **Intake Clearance** Hot .015″ Operating, .004″ Timing
- **Exhaust Timing—Open** 55° B.B.C. **Close** 22° A.T.C.
- **Exhaust Clearance** Hot .015″ Operating, .004″ Timing

Carburetor Stromberg AA1

Steering Caster $-\frac{1}{8}$° Camber $-\frac{1}{4}$° Toe-in 0″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** $13\frac{1}{4}$ Qts.

Clutch Long **Facings** Woven 6″ x 10″ x $\frac{1}{8}$″ 2 Required

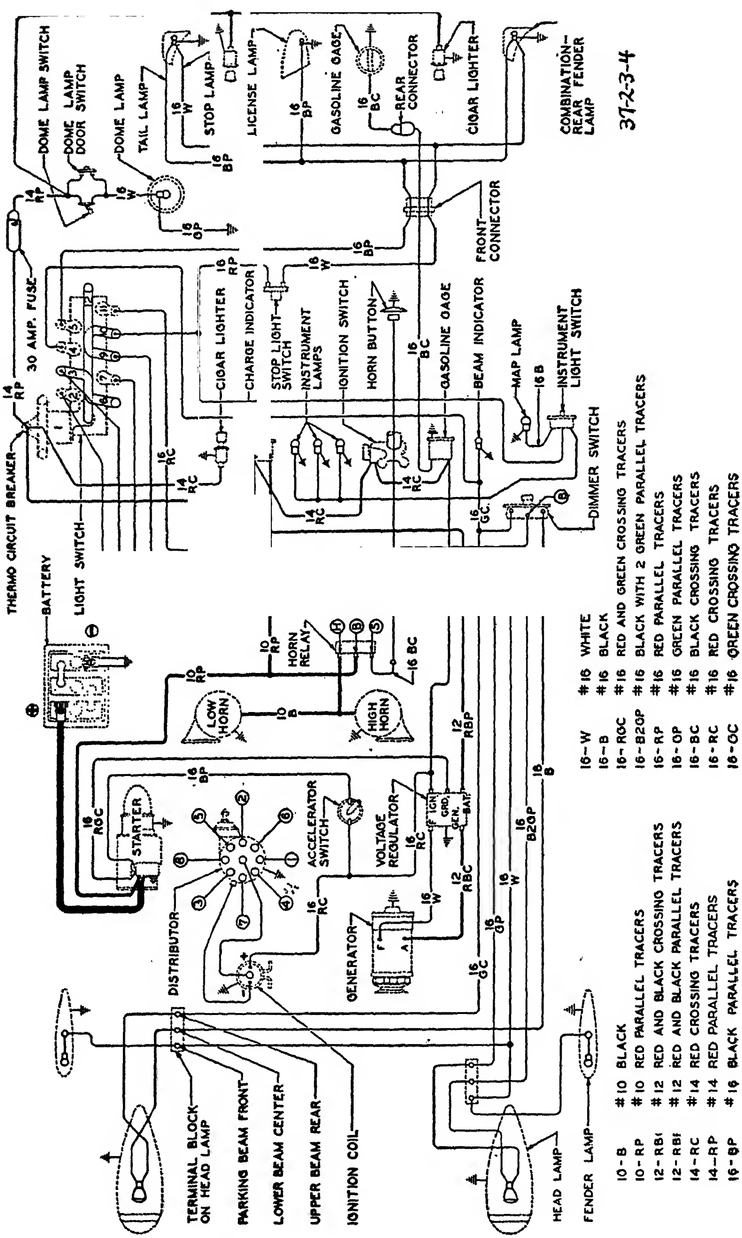
Gear Ratio Ring Gear 44 Pinion 10 Hypoid Gears

Axle Own Semi-Floating

Bendix Hydraulic
- **Front** $22\frac{11}{16}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″ Clearance .010″
- **Rear** $22\frac{11}{16}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″ Clearance .010″
- **Hand** Rear Service

Lining Woven

Diagram 37-1



BUICK WIRING DIAGRAM, 1937, MODELS 60, 80, 90

Courtesy of Buick Motor Company

Buick **Model 60** **Year 1937**

Battery Delco-Remy **Type** **Volts** 6-8 **Amps.** 120
Frame Connection Negative

Lighting Mazda 2320L **Head Lights** 6-8, 32-21 C.P.
Mazda 1154 **Stop Light** 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Mazda 55 **Parking Lights** 6-8, 1.5 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 28 Amps. Hot **Speed** 4200 R.P.M., Arm.
Regulation Voltage **Cut-in** 6.5 Volts, 800 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .013″
Spark Plug—Size 18 M.M. **Gap** .022″
Firing Order 1-6-2-5-8-3-7-4
Timing 10° B.T.C. Spark Half Advance

Engine **Bore** 3$\frac{7}{16}$″ **Stroke** 4$\frac{5}{16}$″ **Taxable H.P.** 37.81
Piston Ring—Width Oil 2—$\frac{3}{16}$″ Comp. 2—$\frac{3}{16}$″
Diam. 3$\frac{7}{16}$″ **Gap** Oil .010″ Comp. .010″
Oiling—Type Gear Pump **Capacity** 8 Qts.
Pressure 45 Lbs. @ 35 M.P.H.

Valves **Intake Timing—Open** 14° B.T.C. **Close** 71° A.B.C.
Intake Clearance Hot .015″ Operating, .004″ Timing
Exhaust Timing—Open 56° B.B.C. **Close** 25° A.T.C.
Exhaust Clearance Hot .015″ Operating, .004″ Timing

Carburetor Stromberg AA2

Steering Caster −$\frac{1}{8}$° Camber −$\frac{1}{4}$° Toe-in 0″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 17 Qts.

Clutch Long **Facings** Woven 6$\frac{1}{2}$″ x 11″ x .137″ 2 Required

Gear Ratio Ring Gear 39 Pinion 10 Hypoid Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 22$\frac{11}{16}$″ x 2″ x $\frac{3}{16}$″ Clearance .010″
Rear 22$\frac{11}{16}$″ x 2″ x $\frac{3}{16}$″ Clearance .010″
Hand Rear Service
Lining Woven

Diagram 37-2

Buick **Model 80** **Year 1937** Diagram on Page 58

Battery Delco-Remy **Type** **Volts** 6-8 **Amps.** 120
Frame Connection Negative

Lighting Mazda 2320-L **Head Lights** 6-8, 32-21 C.P.
Mazda 1154 **Stop Light** 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Mazda 55 **Parking Lights** 6-8, 1.5 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 25 Amps. Hot **Speed** 4200 R.P.M.,Arm.
Regulation Voltage **Cut-in** 6.5 Volts, 800 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .013″
Spark Plug—Size 18 M.M. **Gap** .022″
Firing Order 1-6-2-5-8-3-7-4
Timing 10° B.T.C. Spark Half Advance

Engine **Bore** 3$\frac{7}{16}$″ **Stroke** 4$\frac{5}{16}$″ **Taxable H.P.** 37.81

Piston Ring—Width Oil 2—$\frac{3}{16}$″ Comp. 2—$\frac{3}{16}$″
Diam. 3$\frac{7}{16}$″ **Gap** Oil .010″ Comp. .010″
Oiling—Type Gear Pump **Capacity** 8 Qts. **Pressure** 45 Lbs.@35 M.P.H.

Valves **Intake Timing—Open** 14° B.T.C. **Close** 71° A.B.C.
Intake Clearance Hot .015″ Operating, .004″ Timing
Exhaust Timing—Open 56° B.B.C. **Close** 25° A.T.C.
Exhaust Clearance Hot .015″ Operating, .004″ Timing

Carburetor Stromberg AA2

Steering Caster $\frac{3}{8}$° Camber $\frac{1}{4}$° Toe-in 0″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 17 Qts.

Clutch Long **Facings** Woven 6½″ x 11″ x .137″ 2 Required

Gear Ratio Ring Gear 38 Pinion 9 Hypoid Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 22$\frac{11}{16}$″ x 2″ x $\frac{3}{16}$″ Clearance .010″
Rear 22$\frac{11}{16}$″ x 2″ x $\frac{3}{16}$″ Clearance .010″
Hand Rear Service
Lining Woven **Diagram** 37-3

Buick **Model 90** **Year 1937** Diagram on Page 58

Battery Delco-Remy **Type** **Volts** 6-8 **Amps.** 120
Frame Connection Negative

Lighting Mazda 2320L **Head Lights** 6-8, 32-21 C.P.
Mazda 1154 **Stop Light** 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Mazda 55 **Parking Lights** 6-8, 1.5 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 25 Amps. Hot **Speed** 4200 R.P.M., Arm.
Regulation Voltage **Cut-in** 6.5 Volts, 800 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .013″
Spark Plug—Size 18 M.M. **Gap** .022″
Firing Order 1-6-2-5-8-3-7-4
Timing 10° B.T.C. Spark Half Advance

Engine **Bore** 3 7/16″ **Stroke** 4 5/16″ **Taxable H.P.** 37.81
Piston Ring—Width Oil 2—3/16″ Comp. 2—
Diam. 3 7/16″ **Gap** Oil .010″ .p. .010″
Oiling—Type Gear Pump **Capacity** 8 Qts.
Pressure 45 Lbs. @ 35 M.P.H.

Valves **Intake Timing—Open** 14° B.T.C. **Close** 71° A.B.C.
Intake Clearance Hot .015″ Operating, .004″ Timing
Exhaust Timing—Open 56° B.B.C. **Close** 25° A.T.C.
Exhaust Clearance Hot .015″ Operating, .004″ Timing

Carburetor Stromberg AA2

Steering Caster −3/8° Camber −1/4° Toe-in 0″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 17 Qts.

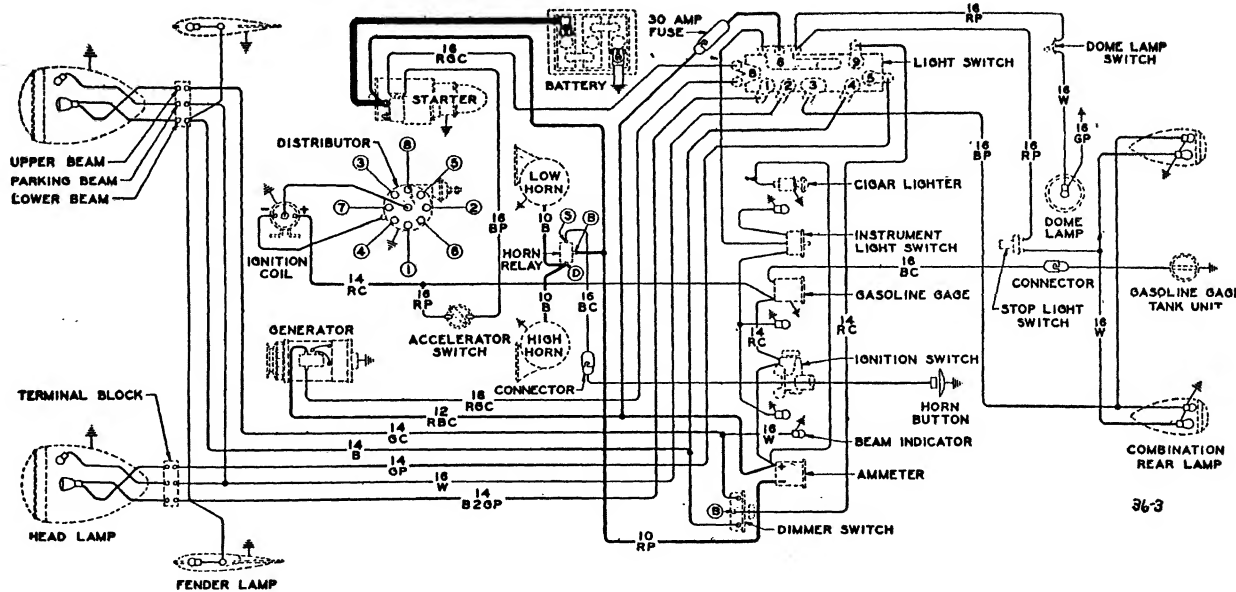
Clutch Long **Facings** Woven 6½″ x 11″ x .137″ 2 Required

Gear Ratio Ring Gear 37 Pinion 8 Hypoid Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 26 13/16″ x 2″ x ¼″ Clearance .010″
Rear 26 13/16″ x 2″ x ¼″ Clearance .010″
Hand Rear Service

Lining Woven Diagram 37-4



BUICK WIRING DIAGRAM, 1936, SERIES 40
Courtesy of Buick Motor Company

Buick **Model Series 40** **Year 1936**

Battery Delco **Type** 13 JW **Volts** 6 **Amps.** 100
Frame Connection Negative

Lighting Mazda 2320-L **Head Lights** 6-8, 32-21 C.P.
Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 17 to 20 Amps. **Speed** 31 M.P.H.
Regulation 3rd Brush **Cut-in** 6.4-7 Volts
Relay Air Gap **Contact Gap** .018″-.025″

Ignition Remy
Contact Breaker Gap .012″
Spark Plug—Size 18 M.M. **Gap** .020″-.025″
Firing Order 1-6-2-5-8-3-7-4
Timing 2° Full Advance

Engine **Bore** [illegible] **Stroke** 3⅛″ **Taxable H.P.** 30.63
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3 3/32″ Gap Oil .010″-.018″ Comp. .010″-.015″
Oiling—Type Pump **Capacity** 7 Qts. **Refill** 6 Qts.

Valves **Intake Timing—Open** 8° B.T.C. **Close** 58° A.B.C.
Intake Clearance .015″
Exhaust Timing—Open 58° B.B.C. **Close** 23° A.T.C.
Exhaust Clearance .015″

Carburetor Stromberg EE1

Steering Caster 3° to 3½° Camber 2° Toe-in 3/16″

Cooling System Centrifugal **Type** Pump **Capacity** 13¼ Qts.

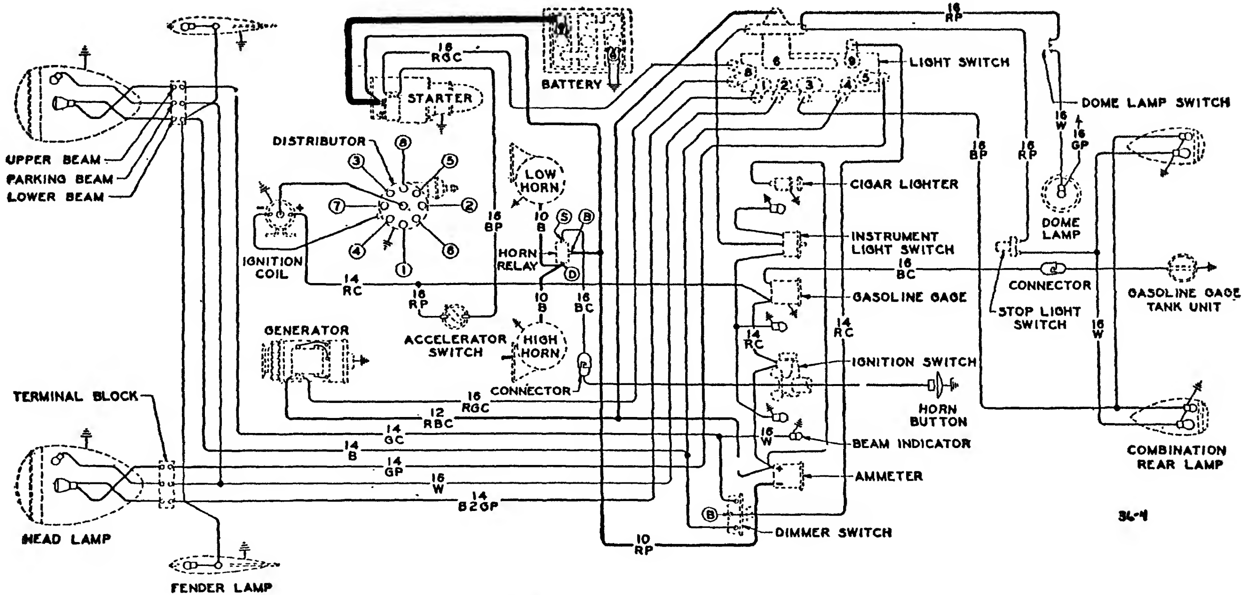
Clutch Borg & Beck **Facings** Woven 6⅛″ x 9½″ x .133″ 2 Required

Gear Ratio 4.44 to 1 Spiral Gears

Axle Semi-Floating

Brakes Bendix Hydraulic
Front 22 11/16″ x 1¾″ x 3/16″ Clearance .010″
Rear 22 11/16″ x 1¾″ x 3/16″
Hand Rear Service

Lining Woven **Diagram** 36-3



BUICK WIRING DIAGRAM, 1936, SERIES 60-80
Courtesy of Buick Motor Company

Buick **Models Series 60-80** **Year 1936**

Battery Delco **Type** 15-G-W **Volts** 6 **Amps.** 120
Frame Connection Negative

Lighting Mazda 2320L **Head Lights** 6-8, 32-21 C.P.
Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 1.5 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 15-18 Amps. **Speed**
Regulation 3rd Brush and Voltage Control
Cut-in 6.4-7 Volts
Contact Gap .018″-.025″

Ignition Remy
Contact Breaker Gap .0125″-.0175″
Spark Plug—Size 18 M.M. **Gap** .020″-.025″
Firing Order 1-6-2-5-8-3-7-4
Timing 10° Full Advance

Engine **Bore** 3 7/16″ **Stroke** 4 5/16″ **Taxable H.P.** 37.81
Piston Ring—Width Oil 2—5/32″ Comp. 2—1/8″
Diam. 3 7/16″ **Gap** Oil .010″-.018″ Comp. .010″-.015″
Oiling—Type Pump **Capacity** 10 Qts. Refill 8 Qts.

Valves **Intake Timing—Open** 14° B.T.C. **Close** 71° A.B.C.
Intake Clearance .015″
Exhaust Timing—Open 56° B.B.C. **Close** 25° A.T.C.
Exhaust Clearance .015″

Carburetor Stromberg EE22

Steering Caster 1 3/4° to 2 1/4° Camber 1/4° Toe-in 1/16″ to 1/8″

Cooling System Centrifugal **Type** Pump **Capacity** 17 Qts.

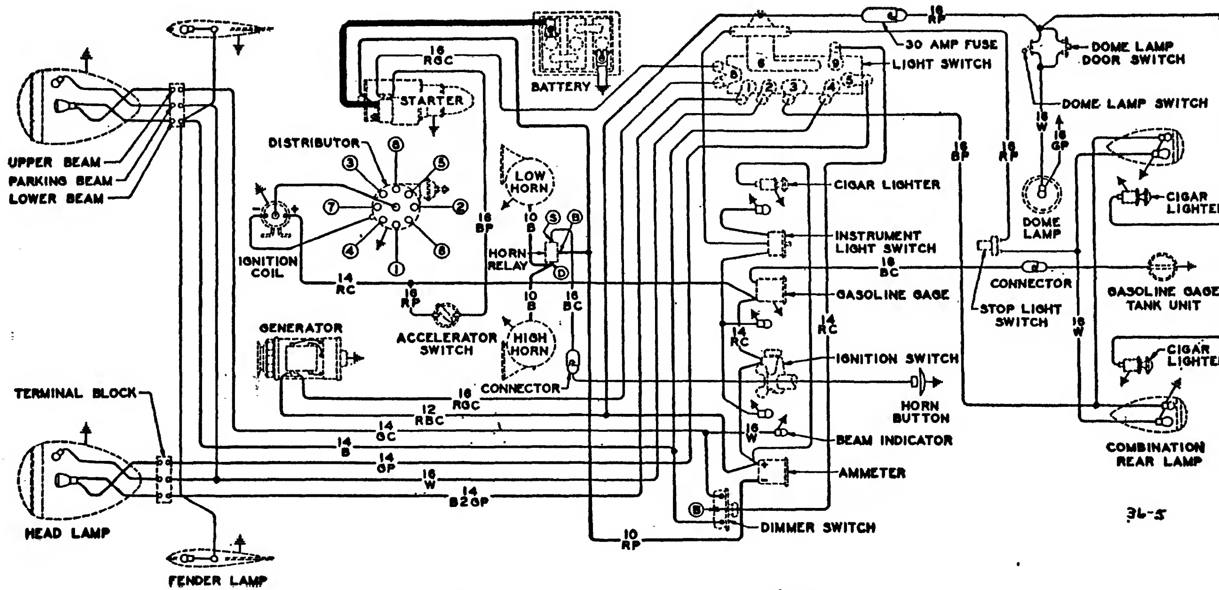
Clutch Long **Facings** Woven 6 1/2″ x 11″ x .137″ 2 Required

Gear Ratio 60, 3.9 to 1; 80, 4.22 to 1 Spiral Gears

Axle Semi-Floating

Brakes Bendix Hydraulic
Front 22 11/16″ x 1 3/4″ x 3/16″ Clearance .010″
Rear 22 11/16″ x 1 3/4″ x 3/16″
Hand Rear Service
Lining Woven

Diagram 36-4



BUICK WIRING DIAGRAM, 1936, SERIES 90

Courtesy of Buick Motor Company

Buick	**Model Series 90**	**Year 1936**

Battery Delco **Type** 15-G-W **Volts** 6-8 **Amps.** 120
Frame Connection Negative

Lighting Mazda 2320L **Head Lights** 6-8, 32-21 C.P.
Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 1.5 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 15-18 Amps. Hot **Speed** 33 M.P.H.
Regulation 3rd Brush and Voltage Control **Cut-in** 6.4-7 Volts
Contact Gap .018″-.025″

Ignition Delco-Remy
Contact Breaker Gap .0125″-.0175″
Spark Plug—Size 18 M.M. **Gap** .020″-.025″
Firing Order 1-6-2-5-8-3-7-4
Timing 10° Full Advance

Engine **Bore** 3 7/16″ **Stroke** 4 5/16″ **Taxable H.P.** 37.81
Piston Ring—Width Oil 2—5/32″ Comp. 2—1/8″
Diam. 3 7/16″ **Gap** Oil .010″-.018″ Comp. .010″-.015″
Oiling—Type Pump **Capacity** 10 Qts. **Refill** 8 Qts.

Valves **Intake Timing—Open** 14° B.T.C. **Close** 70° A.B.C.
Intake Clearance .015″
Exhaust Timing—Open 56° B.B.C. **Close** 25° A.T.C.
Exhaust Clearance .015″

Carburetor Stromberg EE22

Steering Caster 3/4°-1 1/4° Camber 1/4° Neg. to 3/4° Pos. Toe-in 1/16″ to 1/8″

Cooling System Centrifugal **Type** Pump **Capacity** 17 Qts.

Clutch Long **Facings** Woven 6 1/2″ x 11″ x .137″ 2 Required

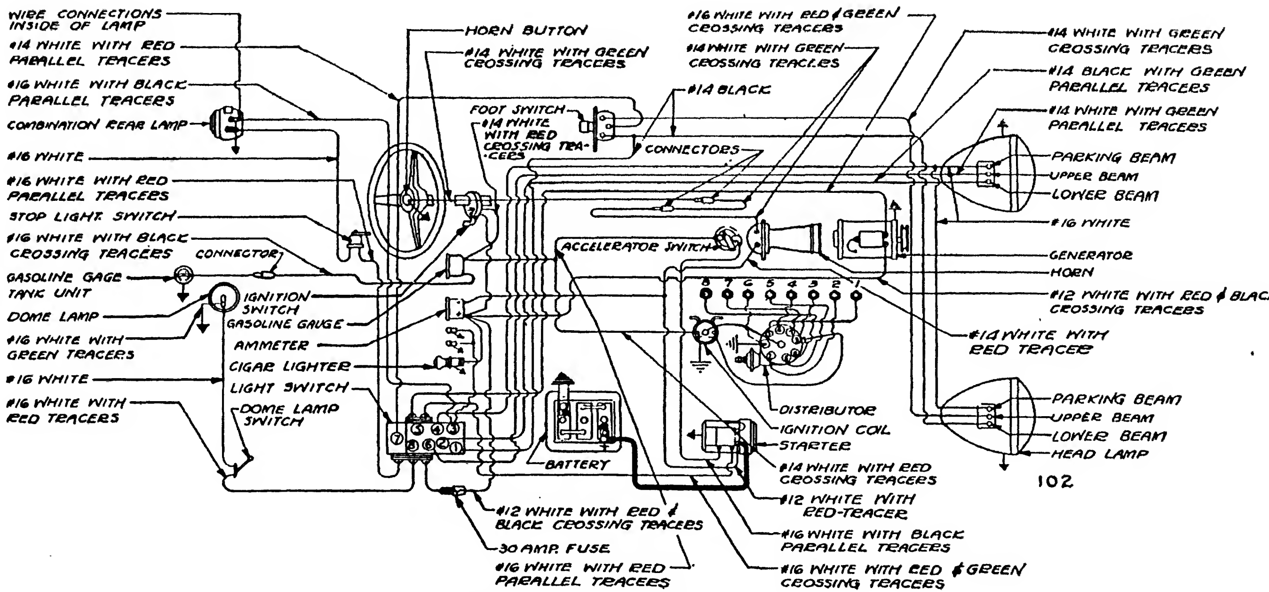
Gear Ratio 4.555 to 1 Spiral Gears

Axle 3/4-Floating

Brakes Bendix Hydraulic
Front 26 13/16″ x 2″ x 1/4″ Clearance .010″
Rear 26 13/16″ x 2″ x 1/4″ Clearance .010″
Hand Rear Service

Lining Woven

Diagram 36-5



BUICK WIRING DIAGRAM, 1935, SERIES 40

Courtesy of Buick Motor Company

Buick **Model Series 40** **Year 1935**

Battery Delco-Remy **Type** 13 JW **Volts** 6 **Amps.** 100
Frame Connection Negative

Lighting Mazda 2320C **Head Lights** 6-8, 32-21 C.P.
Mazda 63L, 81L **Dash, Tail and Stop** 6-8, 3-3-6 C.P.
Mazda 63L **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 13 Amps. **Speed** 3000 R.P.M. Armature
Regulation 3rd Brush **Cut-in** 6.7 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .0125″-.0175″
Spark Plug—Size 18 M.M. **Gap** .020″
Firing Order 1-6-2-5-8-3-7-4
Timing 2° B.T.C. Full Advance

Engine **Bore** 3 3/32′ **Stroke** 3 7/8″ **Taxable H.P.** 30.63
Piston Ring—Width Oil 2—5/32″ Comp. 2—1/8″
Diam. 3 3/32″ **Gap** .010″ on All
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 4½° B.T.C. **Close** 54° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 57½° B.B.C. **Close** 21° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Stromberg EE1

Steering Caster 2¾° Camber ¼° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 3½ Gals.

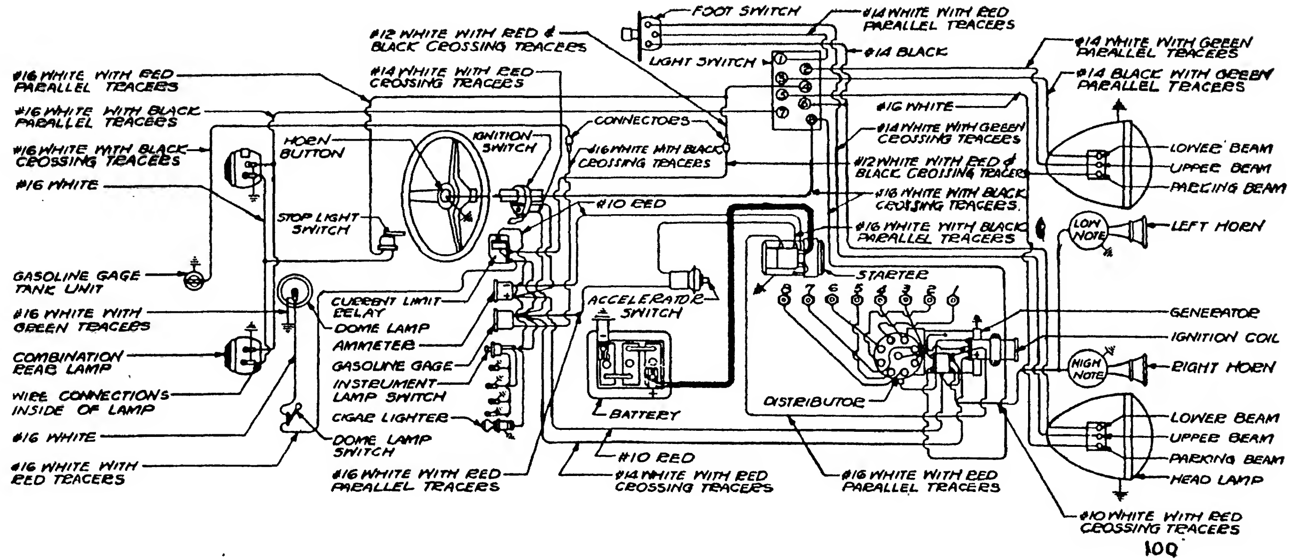
Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅝″ x .133″ 2 Required

Gear Ratio Ring Gear 39 Pinion 9

Axle Own Semi-Floating

Brakes Mechanical Bendix
Front 25 7/8″ x 1¾″ x 3/16″ Clearance .010″
Rear 25 7/8″ x 1¾″ x 3/16″ Clearance .010″
Hand 4 Wheels
Lining Moulded

Diagram 102



BUICK WIRING DIAGRAM, 1935, SERIES 50
Courtesy of Buick Motor Company

Buick **Model Series 50** **Year 1935 After Engine No. 2886405**

Battery Delco-Remy **Type** 13 JW **Volts** 6 **Amps.** 100
Frame Connection Negative

Lighting
Mazda 2330L **Head Lights** 6-8, 32-32 C.P.
Mazda 63L, 81L **Dash, Tail and Stop** 6-8, 3-3-15 C.P.
Mazda 63L **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 13 Amps. **Speed** 2400 R.P.M. Armature
Regulation 3rd Brush **Cut-in** 6.7-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition
Contact Breaker Gap .013″
Spark Plug—Size 18 M.M. **Gap** .020″
Firing Order 1-6-2-5-8-3-7-4
Timing 7° B.T.C. Full Advance

Engine **Bore** $2\frac{31}{32}$″ **Stroke** $4\frac{1}{4}$″ **Taxable H.P.** 28.20
Piston Ring—Width Oil 2—$\frac{5}{32}$″ Comp. 2—$\frac{1}{8}$″ **Diam.** $2\frac{31}{32}$″
Gap .010″ on All
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** $4\frac{1}{2}$° B.T.C. **Close** 54° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 58° B.B.C. **Close** 30° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Marvel ED1S

Cooling System Centrifugal **Type** Pump **Capacity** $3\frac{7}{8}$ Gals.

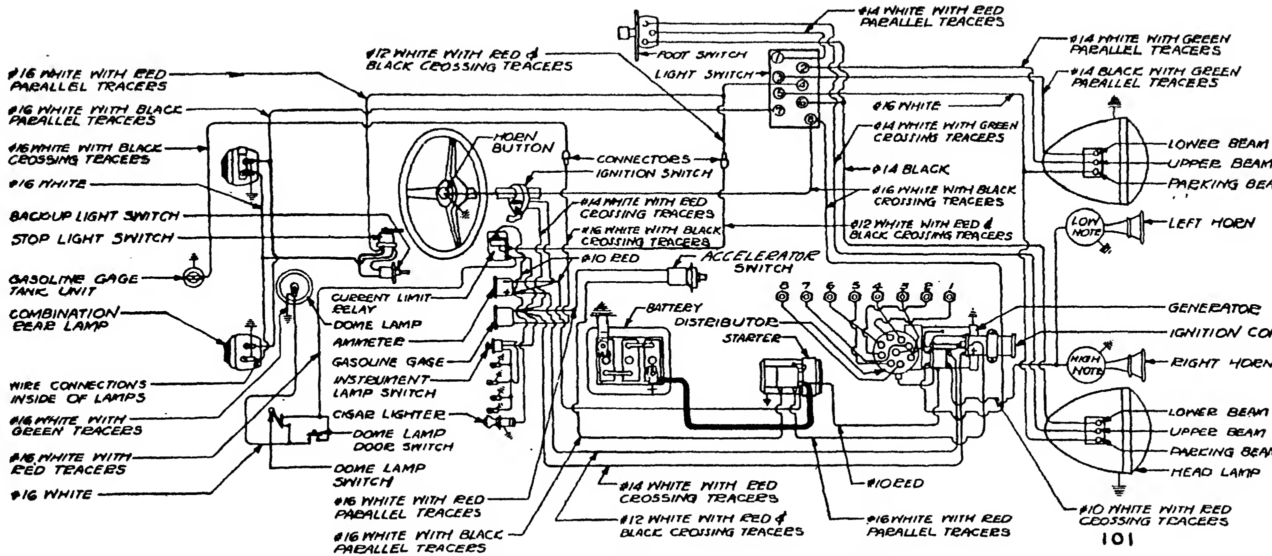
Clutch Own **Facings** Woven $6\frac{1}{4}$″ x $9\frac{1}{2}$″ x .130″ 2 Required

Gear Ratio Ring Gear 44 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes
Mechanical
Bendix
Front $25\frac{1}{8}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″
Rear $25\frac{1}{8}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″
Hand 4 Wheels
Lining Moulded and Woven

Diagram 100



BUICK WIRING DIAGRAM, 1935, SERIES 60 AND 90
Courtesy of Buick Motor Company

Buick **Model Series 60 and 90**
Year 1935 **60, After Engine No. 2886415**
90, After Engine No. 2886638

Battery Delco-Remy **Type** 60, 15 GW; 90, 17 DW **Volts** 6 **Amps.** 60, 120; 90, 135

Frame Connection Negative

Lighting Mazda 2330L **Head Lights** 6-8, 32-32 C.P.

Mazda 63L, 81L **Dash, Tail and Stop** 6-8, 3-3-15 C.P.

Mazda 63L **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 13 Amps. **Speed** 2400 R.P.M. Armature

Regulation 3rd Brush **Cut-in** 6.7-7.5 Volts

Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .013″

Spark Plug—Size 18 M.M. **Gap** .020″

Firing Order 1-6-2-5-8-3-7-4

Timing 11° B.T.C. Full Advance

Engine **Bore** 60, $3\frac{3}{32}$″; 90, $3\frac{5}{16}$″ **Stroke** 60, $4\frac{5}{8}$″; 90, 5″ **Taxable H.P.** 60, 30.63; 90, 35.12

Piston Ring—Width Oil 2—$\frac{5}{32}$″ **Comp.** 2—$\frac{1}{8}$″

Diam. as Bore **Gap** .010″ on All

Oiling—Type Pump **Capacity** 60, 8 Qts.; 90, 9 Qts.

Valves **Intake Timing—Open** $4\frac{1}{2}$° B.T.C. **Close** 54° A.B.C.

Intake Clearance .008″ Hot

Exhaust Timing—Open 58° B.B.C. **Close** 30° A.T.C.

Exhaust Clearance .008″ Hot

Carburetor 60, Marvel ED2S; 90, Marvel ED3

Cooling System Centrifugal **Type** Pump **Capacity** 60, $4\frac{1}{2}$ Gals.; 90, $5\frac{3}{4}$ Gals.

Clutch Own **Facings** Woven 60, $6\frac{1}{4}$″ x $9\frac{7}{8}$″ x .130″; 90, $6\frac{1}{2}$″ x 9″ x .135″

Gear Ratio 60, Ring Gear 47 Pinion 10 Spiral Gears

90, Ring Gear 48 Pinion 11 Spiral Gears

Axle Own $\frac{3}{4}$-Floating

Brakes Mechanical Bendix

Front 60, $28\frac{27}{32}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″; 90, 28 $\frac{27}{32}$″ x $2\frac{1}{4}$″ x $\frac{3}{16}$″

Rear 60, $28\frac{27}{32}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″; 90, 28 $\frac{27}{32}$″ x $2\frac{1}{4}$″ x $\frac{3}{16}$″

Hand 4 Wheels

Lining Moulded and Woven

Diagram 101

Buick Models 34-61, 66, 67, 68 / 34-90, 91, 96, 97, 98 — Year 1934 — Series 60 and 90

Battery Delco **Type** 60, 15 GW; 90, 17 GW **Volts** 6 **Amps.** 60, 114; 90, 130
Frame Connection Negative

Lighting

Mazda 2330L	**Head Lights**	6-8, 32-32 C.P.
Mazda 63, 87	**Dash, Tail and Stop**	6-8, 3-3-15 C.P.
Mazda 63	**Side Lights**	6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 11-14 Amps. **Speed** 2200-2600 R.P.M.
Regulation 3rd Brush **Cut-in** 6.7-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .015″
Spark Plug—Size 18 MM. **Gap** .020″-.025″
Firing Order 1-6-2-5-8-3-7-4
Timing 60, 11° B.T.C.; 90, 10° B.T.C.

Engine **Bore** 60, 3 3/32″; 90, 3 5/16″ **Stroke** 60, 4 5/8″; 90, 5″ **Taxable H.P.** 60, 30.63; 90, 35.12

Piston Ring—Width Oil 2—5/32″ Comp. 2—1/8″ **Diam.** 3 5/16″
Gap .010″ on All

Oiling—Type Pump **Capacity** Dry 60, 11½ Qts.; 90, 12½ Qts.

Valves **Intake Timing—Open** 4½° B.T.C. **Close** 54° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 58° B.B.C. **Close** 30° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor 60, Marvel ED 2S; 90, Marvel ED 3

Steering Caster 60, 1°; 90, 1° Camber 60, ½°; 90, 1° Toe-in 60, 5/32; 90, 5/32

Cooling System Centrifugal **Type** Pump **Capacity** 60, 4½ Gals.; 90, 5¾ Gals.

Clutch Own **Facings** Woven 60, 6¼″ x 9⅞″ x .130″ 2 Required
90, 6½″ x 9″ x .135″ 4 Required

Gear Ratio Ring Gear 60, 47; 90, 48 Pinion 60, 10, 90, 11 Spiral Gears

Axle Own ¾ Floating

Brakes Own Bendix Mechanical
Front 60, 28, 27/32″ x 1¾″ x 3/16″; 90, 28 27/32″ x 2¼″ x 3/16″
Rear As for Front
Hand 4 Wheels
Lining Moulded and Woven

Buick Models 34-41, 46, 47, 48 Year 1934 Series 40

Battery Delco **Type** 13-JW **Volts** 6 **Amps.** 98
Frame Connection Negative

Lighting Mazda 2330L **Head Lights** 6-8, 32-32 C.P.
Dash, Tail and Stop 3-3-6 C.P.
Side Lights 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 13-15 Amps. **Speed** 3000 R.P.M
Regulation 3rd Brush **Cut-in** 6.7-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .015″-.017″
Spark Plug—Size 18 MM. **Gap** .020″-.025″
Firing Order 1-6-2-5-8-3-7-4
Timing Standard Fuel 2°, Ethyl 8° B.T.C.

Engine **Bore** 3 3/32″ **Stroke** 3 7/8″ **Taxable H.P.** 30-63
Piston Ring—Width Oil 2—5/32″ Comp. 2—1/8″ **Diam.** 3 3/32″
Gap .010″ on All
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 4½° B.T.C. **Close** 40° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 57½° B.B.C. **Close** 21° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Marvel ED1S

Steering Caster 1¾° Camber ½° Toe-in 5/32″

Cooling System Centrifugal **Type** Pump **Capacity** 3 7/8 Gals.

Clutch Own **Facings** Woven 6¼″ x 9½″ x .130″ 2 Required

Gear Ratio Ring Gear 44 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Own
Bendix
Mechanical
Front 25″ x 1¾″ x 3/16″
Rear 25″ x 1¾″ x 3/16″
Hand 4 Wheels

Lining Moulded and Woven

Buick **Models 34-56, 57, 58** **Year 1934** **Series 50**

Battery Delco **Type** 13-JW **Volts** 6 **Amps.** 98
Frame Connection Negative

Lighting
Mazda 2330L **Head Lights** 6-8, 32-32 C.P.
Mazda 63, 87 **Dash, Tail and Stop** 6-8, 3-3-15 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 11-14 Amps. **Speed** 2200-2600 R.P
Regulation 3rd Brush **Cut-in** 6.7-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .015″
Spark Plug—Size 18 MM. **Gap** .020″-.025″
Firing Order 1-6-2-5-8-3-7-4
Timing 7° B.T.C. .0198″ Piston Travel B.T.C.

Engine **Bore** 2 21/32″ **Stroke** 4 1/4″ **Taxable H.P.** 28.2
Piston Ring—Width Oil 2—5/32″ Comp. 2—1/8″ **Diam.** 2 21/32″
Gap .010″ on All
Oiling—Type Pump **Capacity** 9 Qts. Dry

Valves **Intake Timing—Open** 4 1/2° B.T.C. **Close** 54° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 58° B.B.C. **Close** 30° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Marvel ED1S

Steering Caster 1 3/4° Camber 1/2° Toe-in. 5/32″

Cooling System Centrifugal **Type** Pump **Capacity** 3 7/8 Gals.

Clutch Own **Facings** Woven 6 1/4″ x 9 1/2″ x .130″ 2 Required

Gear Ratio Ring Gear 44 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Own Bendix Mechanical
Front 25 1/8″ x 1 3/4″ x 3/16″
Rear 25 1/8″ x 1 3/4″ x 3/16″
Hand 4 Wheels
Lining Moulded and Woven

Buick **Model 33-50** **Year 1933**

Battery Delco **Type** 13 JW **Volts** 6 **Amps.** 98
Frame Connection Negative

Lighting Double Contact **Head Lights** 6-8, 32-32 C.P.
Single Contact **Stop Light** 6-8, 15 **Tail,** 3 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 11-14 Amps. **Speed** 1800-2000 R.P.M.
Regulation 3rd Brush, Thermo. **Cut-in** 8-10 M.P.H.
Relay Air Gap .012″-.017″ **Contact Gap.** .015″-.025″

Ignition **Contact Breaker Gap** .0125″-.0175″
Spark Plug—**Size** 18 M.M. **Gap** .020″-.025″
Firing Order—1-6-2-5-8-3-7-4
Timing 7° B.T.D.C. Full Manual Adv.

Engine **Bore** 2-15/16″ **Stroke** 4-1/4″ **Taxable H.P.** 27.61
Piston Ring—**Width** 2-5/32″, 2-1/8″ **Diam.** 2-15/16″ **Gap** All rings .010″
Oiling—**Type** Pump **Capacity** 7 Qts.

Valves **Intake Timing**—**Open** 4-1/2° B.T.C. **Close** 54° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—**Open** 58° B.B.C. **Close** 30° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Marvel E.D 1.S.

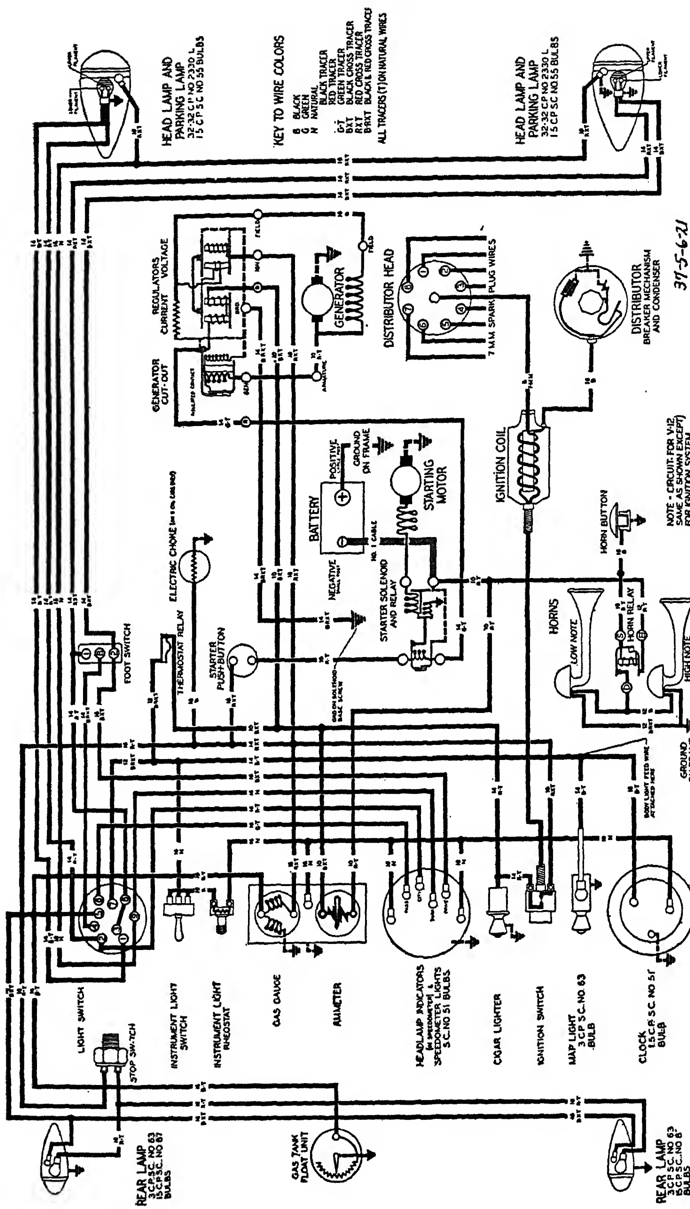
Cooling System—Centrifugal **Type** Pump **Capacity** 3 Gals.

Clutch Own **Facing** Woven 9-1/2″ x 6-1/4″ x .135″

Gear Ratio Ring Gear 47 Pinion 10 Spiral Gears

Axle Own Semi-Floating

Brakes Mechanical **Front** 18-1/32″ x 1-3/4″ x 3/16″
Rear 18-1/32″ x 1-3/4″ x 3/16″
Hand All 4 Wheels
Lining—Moulded



CADILLAC WIRING DIAGRAM, 1937, MODEL 70

Courtesy of Cadillac Motor Car Company

Cadillac **Model 70** **Year 1937**

Battery Delco-Remy **Type** **Volts** 6-8 **Amps.** 130
Frame Connection Positive

Lighting Mazda 2330-L D.C. **Head Lights** 6-8, 32-32 C.P.
Mazda 87 **Stop Light** 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Mazda 55 **Parking Lights** 6-8, 1.5 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 25 Amps. Hot **Speed** 1650 R.P.M., Arm.
Regulation Voltage & Current **Cut-in** 6.5 Volts
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .013″
Spark Plug—Size 14 M.M. **Gap** .027″
Firing Order 1L-4R-4L-2L-3R-3L-2R-1R
Timing 5° B.T.C.

Engine **Bore** 3½″ **Stroke** 4½″ **Taxable H.P.** 39.20
Piston Ring—Width Oil 2—5/32″ Comp. 2—5/32″
Diam. 3½″ **Gap** Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 7 Qts. **Pressure** 30 Lbs. @ 60 M.P.H.

Valves **Intake Timing—Open** T.D.C. **Close** 42° A.B.C.
Intake Clearance Zero
Exhaust Timing—Open 52° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance Zero

Carburetor Stromberg AA25

Steering Caster 0° Camber 0° Toe-in 0″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 25 Qts.

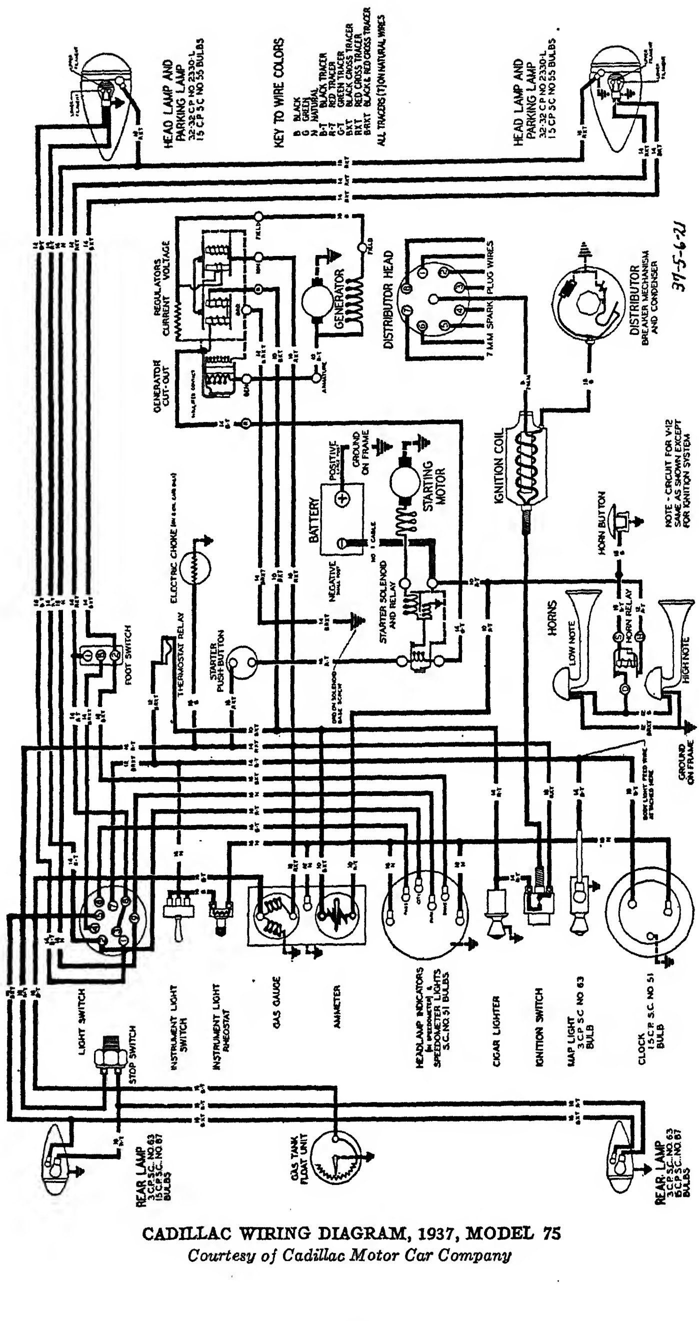
Clutch Long **Facings** Woven 6½″ x 11″ x .137″ 2 Required

Gear Ratio Ring Gear 43 Pinion 10 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 25⅞″ x 2″ x 3/16″ Clearance .010″
Rear 25⅞″ x 2″ x 3/16″ Clearance .010″
Hand Rear Service

Lining Moulded Diagram 37-5



CADILLAC WIRING DIAGRAM, 1937, MODEL 75

Courtesy of Cadillac Motor Car Company

Cadillac **Model 75** **Year 1937**

Battery Delco-Remy **Type** **Volts** 6-8 **Amps.** 130
Frame Connection Positive

Lighting Mazda 2330-L D.C. **Head Lights** 6-8, 32-32 C.P.
Mazda 87 **Stop Light** 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Mazda 55 **Parking Lights** 6-8, 1.5 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 25 Amps. Hot **Speed** 1650 R.P.M., Arm.
Regulation Voltage & Current **Cut-in** 6.5 Volts
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .013″
Spark Plug—Size 14 M.M. **Gap** .027″
Firing Order 1L-4R-4L-2L-3R-3L-2R-1R
Timing 5° B.T.C.

Engine **Bore** 3½″ **Stroke** 4½″ **Taxable H.P.** 39.20
Piston Ring—Width Oil 2—5/32″ Comp. 2—5/32″
Diam. 3½″ Gap Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 7 Qts. **Pressure** 30 Lbs. @ 60 M.P.H.

Valves **Intake Timing—Open** T.D.C. **Close** 42° A.B.C.
Intake Clearance Zero
Exhaust Timing—Open 52° B.B.C. **Close** 10°A.T.C.
Exhaust Clearance Zero

Carburetor Stromberg AA25

Steering Caster 0° Camber 0° Toe-in 0″

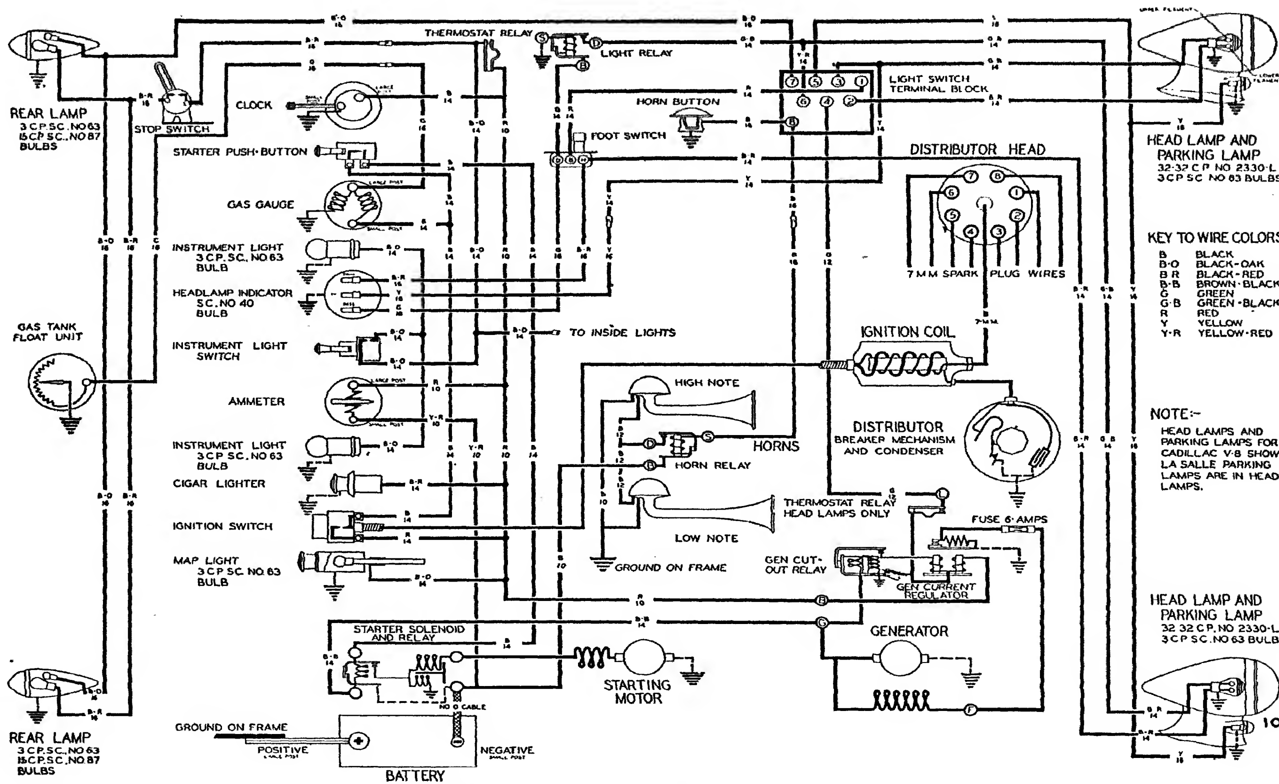
Cooling System Centrifugal **Type** Pump, Belt **Capacity** 25 Qts.

Clutch Long **Facings** Woven 6½″ x 11″ x .137″ 2 Required

Gear Ratio Ring Gear 46 Pinion 10 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 30″ x 2¼″ x ¼″ Clearance .010″
Rear 27¼″ x 2¼″ x ¼″ Clearance .010″
Hand Rear Service
Lining Moulded Diagram 37-6



CADILLAC WIRING DIAGRAM, 1935, MODEL 355-D

Courtesy of Cadillac Motor Car Company

Cadillac Model 355-D Year 1935

Battery Delco **Type** 17 DW **Volts** 6 **Amps.** 130
Frame Connection Positive

Lighting
Mazda 2330-L **Head Lights** 6-8, 32-32 C.P.
Mazda 63L, 87L **Dash, Tail and Stop** 6-8, 3-3-15 C.P.
Mazda 63L **Side Lights** 6-8, 3 C.P.

Starter and Generator

Generator Hot **Max. Chg. Rate** 15.5 Amp. **Speed**
Regulation 3rd Brush **Cut-in** 6.75-7.25 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition
Contact Breaker Gap .012″-.018″
Spark Plug—Size 18 M.M. **Gap** .025″-.027″
Firing Order 1-2-7-8-4-5-6-3
Timing 4° B.T.C.

Engine **Bore** : **Stroke** $4\frac{15}{16}$″ **Taxable H.P.** 36.45
Piston Ring—Width Oil 1—$\frac{3}{16}$″ Comp. 3—$\frac{3}{32}$″
Diam. $3\frac{3}{8}$″ **Gap.** Oil .007″ Comp. .007″
Oiling—Type Pump **Capacity** 8 Qts.

Valves
Intake Timing—Open 6° B.T.C. **Close** 42° A.B.C.
Intake Clearance .006″
Exhaust Timing—Open 38° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance .010″

Carburetor Detroit X8244

Steering Caster 3° Camber 1° Toe-in $\frac{1}{16}$″

Cooling System Centrifugal **Type** Pump **Capacity** 5 Gals.

Clutch Own **Facings** Woven $6\frac{1}{2}$″ x $9\frac{1}{2}$″ x .120″ 4 Required

Gear Ratio Ring Gear 46 Pinion 10 Spiral Gears

Axle Own $\frac{3}{4}$-Floating

Brakes Mechanical Bendix
Front $29\frac{27}{32}$″ x 2″ Forward Shoe .245″, Reverse .183″ Clearance .007″
Rear $29\frac{27}{32}$″ x 2″ Forward Shoe .245″, Reverse .183″ Clearance .007″
Hand Rear Service
Lining Woven

Diagram 103

Cadillac Model V-8 355-D Year 1934 Series 10, 20, 30

Battery	Delco	**Type** 17 DW	**Volts** 6	**Amps.** 130
		Frame Connection	Positive	
Lighting	Mazda 2330L	**Head Lights**	6-8, 32-32 C.P.	
	Mazda 63	**Dash, Tail and Stop**	6-8, 3-3-15 C.P.	
	Mazda 63	**Side Lights**	6-8, 3 C.P.	

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 9-11 Amps. Lamps Off **Speed** 1200 R.P.M.
Regulation Thermostat Relay **Cut-in** 6.75 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 18 MM. **Gap** .025″-.027″
Firing Order 1-2-7-8-4-5-6-3 See Diagram
Timing 4° B.T.C.

Engine **Bore** 3⅜″ **Stroke** 4$^{15}/_{16}$″ **Taxable H.P.** 36.45
Piston Ring—Width Oil 1—$^{3}/_{16}$″ Comp. 3—$^{3}/_{32}$″
Diam. 3⅜″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** 6° B.T.C. **Close** 42° A.B.C.
Intake Clearance .006″ Cold
Exhaust Timing—Open 38° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance .010″ Cold

Carburetor Detroit X8244

Steering Camber 1° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 5 Gals.

Clutch Own **Facings** Woven 6½″ x 9½″ x .120″ 4 Required

Gear Ratio Ring Gear 46 Pinion 10 Spiral Gears

Axle Own ¾ Floating

Brakes Own Mechanical Bendix
- **Front** 29$^{27}/_{32}$″ x 2″ x .245″ Forward Shoe .183″ Reverse Shoe
- **Rear** Same as Front Clearance .007″ on All
- **Hand** Rear Service

Lining Woven

Cadillac Model V-8 355C Year 1933

Battery Delco **Type** 17-CF **Volts** 6 **Amps.** 130
Frame Connection Positive

Lighting Triple Contact **Head Lights** 6-8, 32-21-21 C.P.
Single Contact **Dash, Tail and Stop** 6-8, 3-3-15 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 14-17 Amps. **Speed** 1800-2000 R.P.M.
Regulation 3rd Brush **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 18 MM. **Gap** .025″-.028″
Firing Order 1R-1L-4R-4L-2L-3R-3L-2R
Timing 9° 12″ Flywheel or .039″ Piston B.T.C.

Engine **Bore** **Stroke** $4\frac{15}{16}$″ **Taxable H.P.** 36.45
Piston Ring—Width Oil 1—$\frac{3}{16}$″, 1—$\frac{5}{32}$″; Comp. 1—$\frac{1}{8}$″, 2—$\frac{3}{32}$″
Diam. $3\frac{3}{8}$″ **Gap** Oil .003″ Comp. .005″
Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** 6° B.T.C. **Close** 42° A.B.C.
Intake Clearance .004″ Hot
Exhaust Timing—Open 38° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance .006″ Hot

Carburetor Own

Steering Caster $2\frac{1}{2}$° Camber $1\frac{1}{2}$° Toe-in $\frac{1}{8}$″

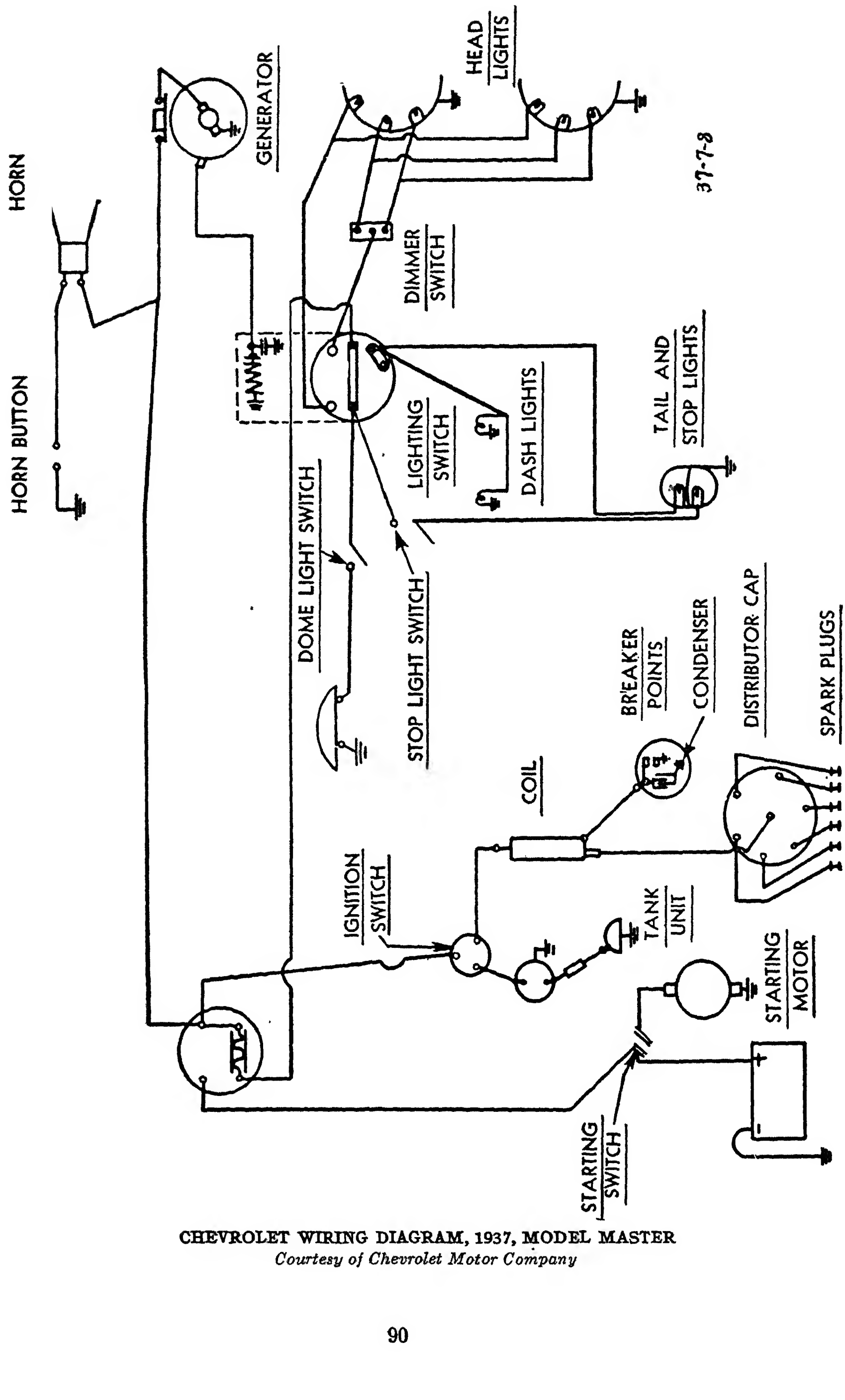
Cooling System Centrifugal **Type** Pump **Capacity** $6\frac{1}{2}$ Gals.

Clutch Own **Facing** Woven $5\frac{1}{2}$″ x 10″ x .135″ 4 Required

Gear Ratio Ring Gear 46 Pinion 10 Spiral Gears

Axle Own $\frac{3}{4}$ Floating

Brakes **Front** $29\frac{3}{4}$″ x 2″ x $\frac{3}{16}$″ Clearance .007″
Bendix
Booster **Rear** $29\frac{3}{4}$″ x 2″ x $\frac{3}{16}$″ Clearance .007″
Mechanical
Hand 4 Wheels
Lining Semi-Moulded



CHEVROLET WIRING DIAGRAM, 1937, MODEL MASTER
Courtesy of Chevrolet Motor Company

Chevrolet **Model Master** **Year 1937**

Battery Delco-Remy **Type** **Volts** 6-8 **Amps.** 100

Frame Connection Negative

Lighting **Head Lights** 6-8 Volts

Stop Light 6-8 Volts **Tail** 6-8 Volts

Parking Lights 6-8 Volts

Starter and Generator Delco-Remy

Generator Delco-Remy **Max. Chg. Rate** 18 Amps. Hot **Speed** 2900 R.P.M., Arm.

Regulation **Cut-in** 6.8 Volts, 800 R.P.M.

Relay Air Gap **Contact Gap**

Ignition Delco-Remy **Contact Breaker Gap** .018"

Spark Plug—Size 14 M.M. **Gap** .040"

Firing Order 1-5-3-6-2-4

Timing

Engine **Bore** 3½" **Stroke** 3¾" **Taxable H.P.** 29.50

Piston Ring—Width Oil 1—3/16" Comp. 2—⅛"
Diam. 3½" **Gap** Oil .005" Comp. .005"

Oiling—Type Gear Pump **Capacity** 5 Qts.
Pressure 13 Lbs. @ 50 M.P.H.

Valves **Intake Timing—Open** 9° B.T.C. **Close** 29° A.B.C.

Intake Clearance Hot .006"

Exhaust Timing—Open 52° B.B.C. **Close** 1° B.T.C.

Exhaust Clearance Hot .013"

Carburetor Carter W1

Steering Caster 3⅓° Camber ¼° Toe-in 1/16"

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 13 Qts.

Clutch Own **Facings** Woven 6¼" x 9" x ⅛" 2 Required

Gear Ratio Ring Gear 41 Pinion 11 Hypoid Gears

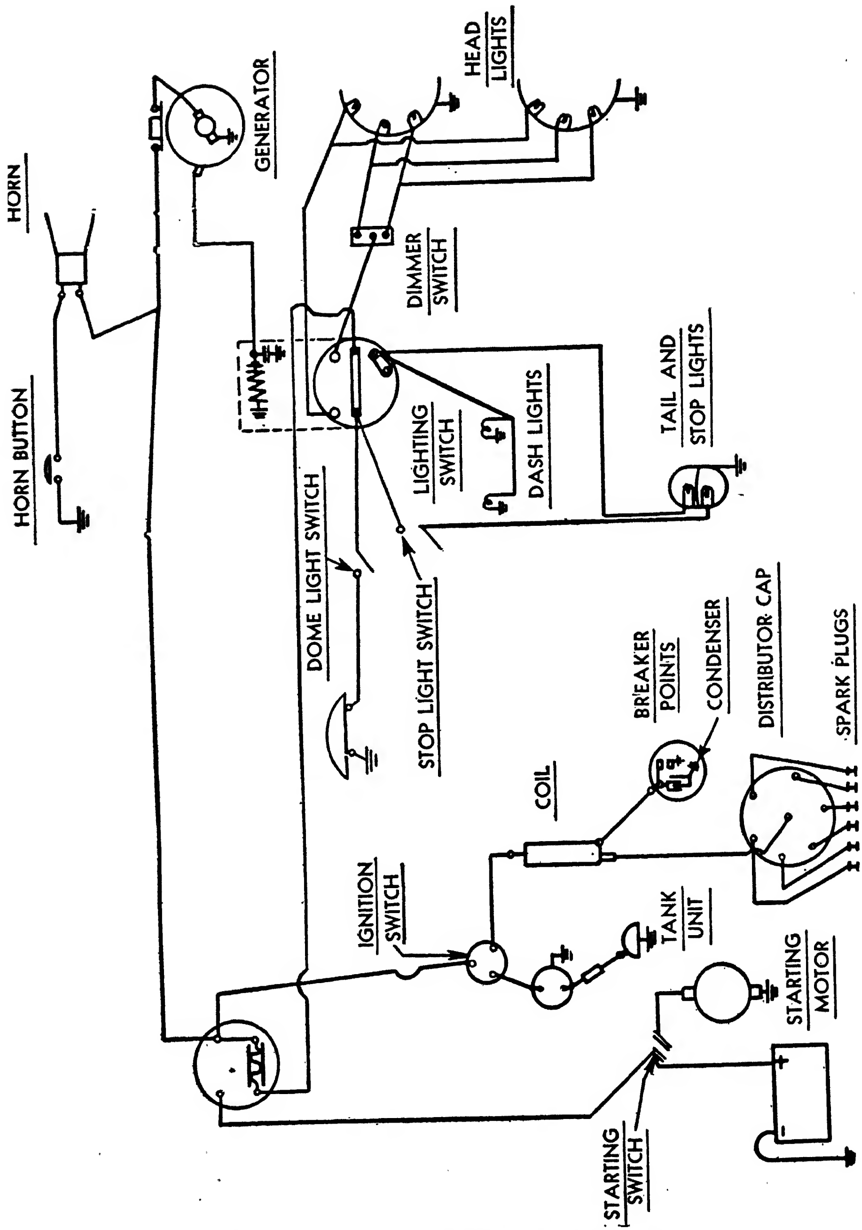
Axle Own Semi-Floating

Brakes Own Hydraulic **Front** 22⅝" x 1¾" x 3/16" Clearance, Slight Drag and Back 4 Notches

Rear 22⅝" x 1¾" x 3/16" Clearance, Slight Drag and Back 4 Notches

Hand Rear Service

Lining Moulded Diagram 37-7



CHEVROLET WIRING DIAGRAM, 1937, MODEL DeLUXE
Courtesy of Chevrolet Motor Company

Chevrolet	Model De Luxe	Year 1937		
Battery	Delco-Remy	**Type**	**Volts** 6-8	**Amps.** 100
		Frame Connection Negative		
Lighting		**Head Lights**	6-8 Volts	
		Stop Light	6-8 Volts	**Tail** 6-8 Volts
		Parking Lights	6-8 Volts	

Starter and Generator Delco-Remy

Generator Delco-Remy
- **Max. Chg. Rate** 18 Amps. Hot **Speed** 2900 R.P.M., Arm.
- **Regulation** **Cut-in** 6.8 Volts, 800 R.P.M.
- **Relay Air Gap** **Contact Gap**

Ignition Delco-Remy
- **Contact Breaker Gap** .018″
- **Spark Plug—Size** 14 M.M. **Gap** .040″
- **Firing Order** 1-5-3-6-2-4
- **Timing**

Engine **Bore** $3\frac{1}{2}$″ **Stroke** $3\frac{3}{4}$″ **Taxable H.P.** 29.50
- **Piston Ring—Width** Oil 1—$\frac{3}{16}$″ Comp. 2—$\frac{1}{8}$″
- **Diam.** $3\frac{1}{2}$″ Gap. Oil .005″ Comp. .005″
- **Oiling—Type** Gear Pump **Capacity** 5 Qts. **Pressure** 13 Lbs. @ 50 M.P.H.

Valves
- **Intake Timing—Open** 9° B.T.C. **Close** 29° A.B.C.
- **Intake Clearance** Hot .006″
- **Exhaust Timing—Open** 52° B.B.C. **Close** 1° B.T.C.
- **Exhaust Clearance** Hot .013″

Carburetor Carter W1

Steering Caster 0° Camber $\frac{1}{4}$° Toe-in $\frac{1}{16}$″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 13 Qts.

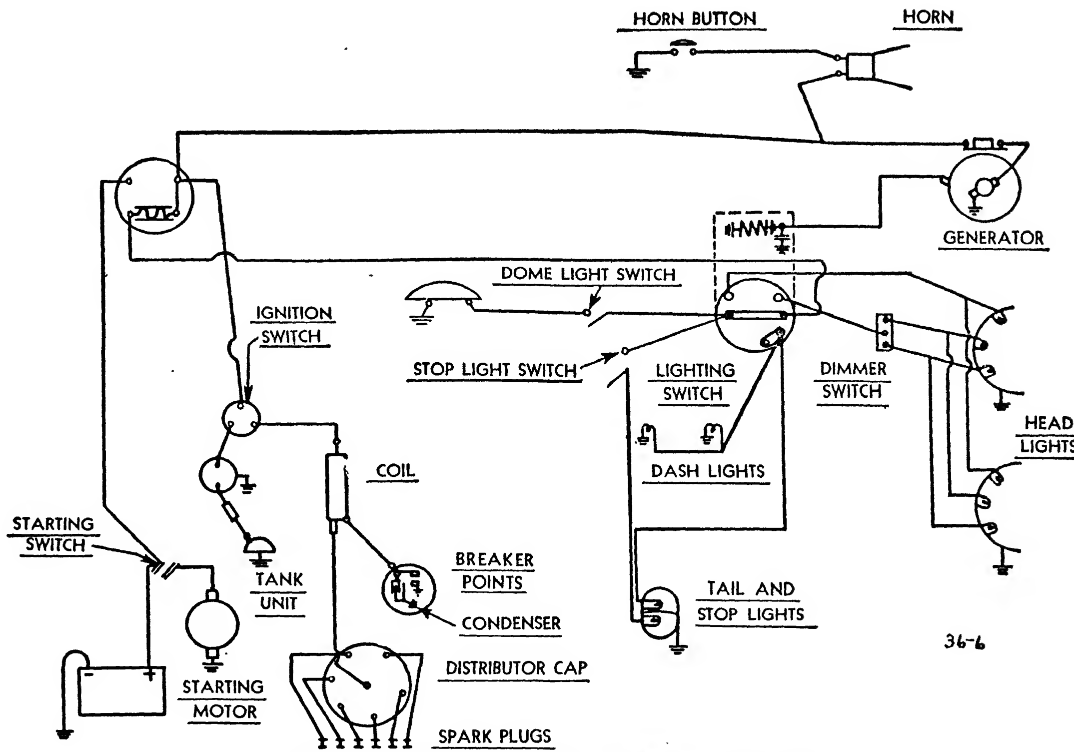
Clutch Own **Facings** Woven $6\frac{1}{4}$″ x 9″ x $\frac{1}{8}$″ 2 Required

Gear Ratio Ring Gear 38 Pinion 9 Hypoid Gears

Axle Own Semi-Floating

Brakes Own Hydraulic
- **Front** $22\frac{5}{8}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″ Clearance Slight Drag & Back 4 Notches
- **Rear** $22\frac{5}{8}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″ Clearance Slight Drag & Back 4 Notches
- **Hand** Rear Service
- **Lining** Moulded

Diagram 37-8



CHEVROLET WIRING DIAGRAM, 1936, MODEL, 6-CYLINDER
Courtesy of Chevrolet Motor Company

Chevrolet **Model 6-Cylinder** **Year 1936**

Battery Delco-Remy **Type** **Volts** 6 **Amps.** 94

Frame Connection Negative

Lighting

Head Lights

Stop Light **Tail**

Parking Lights

Starter and Generator Delco-Remy

Generator **Max. Chg. Rate** 18 Amps. **Speed** 26 M.P.H.

Regulation 3rd Brush **Cut-in** 6.7 Volts

Relay Air Gap **Contact Gap**

Ignition Remy

Contact Breaker Gap .018″

Spark Plug—Size 14 M.M. **Gap** .032″

Firing Order 1-5-3-6-2-4

Timing 5° B.T.C. Retarded

Engine **Bore** 3 5/16″ **Stroke** 4″ **Taxable H.P.** 26.30

Piston Ring—Width Oil 1—3/16″ **Comp.** 2—1/8″

Diam. 3 5/16″ **Gap** .005″

Oiling—Type Pressure and Splash **Capacity** 5 Qts.

Valves **Intake Timing—Open** 9° B.T.C. **Close** 29° A.B.C.

Intake Clearance .006″ Hot

Exhaust Timing—Open 52° B.B.C. **Close** 1° B.T.C.

Exhaust Clearance .013″ Hot

Carburetor Carter

Steering Caster 0° Camber 1/4° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump **Capacity** 15 Qts.

Clutch Own **Facings** Woven 6 1/4″ x 9″ x 1/8″ 2 Required

Gear Ratio 4.1 to 1 Spiral Gears

Axle Own Semi-Floating

Brakes Own Hydraulic

Front 22 5/8″ x 1 3/4″ x 3/16″

Rear 22 5/8″ x 1 3/4″ x 3/16″

Hand Rear Service

Clearance, Slight Drag and Back-off Adjustment 4 Notches

Lining Moulded

Diagram 36-6

Chevrolet **Model Series DA** **Year 1934**

Battery	Delco	**Type** 15-PW	**Volts** 6	**Amps.** 94
		Frame Connection	Negative	

Lighting	Mazda 2320-C	**Head Lights**	6-8, 32-21 C.P.
	Mazda 63	**Dash, Tail and Stop**	6-8, 3 C.P.
	Mazda 63	**Side Lights**	6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot
Max. Chg. Rate 13-15 Amps. **Speed** 3000 R.P.M.
Regulation 3rd Brush **Cut-in** 7.2 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition
Contact Breaker Gap .018″
Spark Plug—Size 14 MM. **Gap** .032″
Firing Order 1-5-3-6-2-4
Timing 10° B.T.C.

Engine **Bore** $3\frac{5}{16}$″ **Stroke** 4″ **Taxable H.P.** 26.3
Piston Ring—Width Oil 1—$\frac{3}{16}$″ Comp. 2—$\frac{1}{8}$″
Diam. $3\frac{5}{16}$″ **Gap** Oil .004″ Comp. .005″
Oiling—Type Press. and Splash **Capacity** 5 Qts.

Valves **Intake Timing—Open** 4° B.T.C. **Close** 34° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 47° B.B.C. **Close** 4° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Carter WL

Cooling System Centrifugal **Type** Pump **Capacity** $2\frac{5}{8}$ Gals.

Clutch Own **Facings** $6\frac{1}{4}$″ x 9″ x $\frac{1}{8}$″ 2 Required

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Own Mechanical
Front $24\frac{9}{32}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″
Rear $24\frac{9}{32}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″
Hand 4 Wheels
Lining Semi-Moulded

Chevrolet **Model Series DC** **Year 1934**

Battery	Delco	**Type** 13 NW and 13 PW	**Volts** 6	**Amps.** 90
		Frame Connection	Negative	

Lighting	Mazda 1110	**Head Lights**	6-8, 21-21 C.P.
	Mazda 63	**Dash, Tail and Stop**	6-8, 3 C.P.
	Mazda 63	**Side Lights**	6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator	Hot	**Max. Chg. Rate** 11-13 Amps.	**Speed** 1750-1850 R.P.M.
		Regulation 3rd Brush	**Cut-in** 7.2 Volts
		Relay Air Gap .012″-.017″	**Contact Gap** .015″-.025″

Ignition	**Contact Breaker Gap** .018″	
	Spark Plug—Size 14 MM.	**Gap** .032″
	Firing Order 1-5-3-6-2-4	
	Timing 10° B.T.C.	

Engine **Bore** 3 5/16″ **Stroke** 3½″ **Taxable H.P.** 26.3

Piston Ring—Width Oil 1—3/16″ **Comp.** 2—5/32″
Diam. 3 5/16″ **Gap** .004″ on All

Oiling—Type Press. and Splash **Capacity** 4½ Qts.

Valves	**Intake Timing—Open** 4° B.T.C.	**Close** 34° A.B.C.
	Intake Clearance .006″ Hot	
	Exhaust Timing—Open 47° B.B.C.	**Close** 4° A.T.C.
	Exhaust Clearance .013″ Hot	

Carburetor Carter WL

Steering Caster 2¼° Camber 1½° Toe-in 5/64″

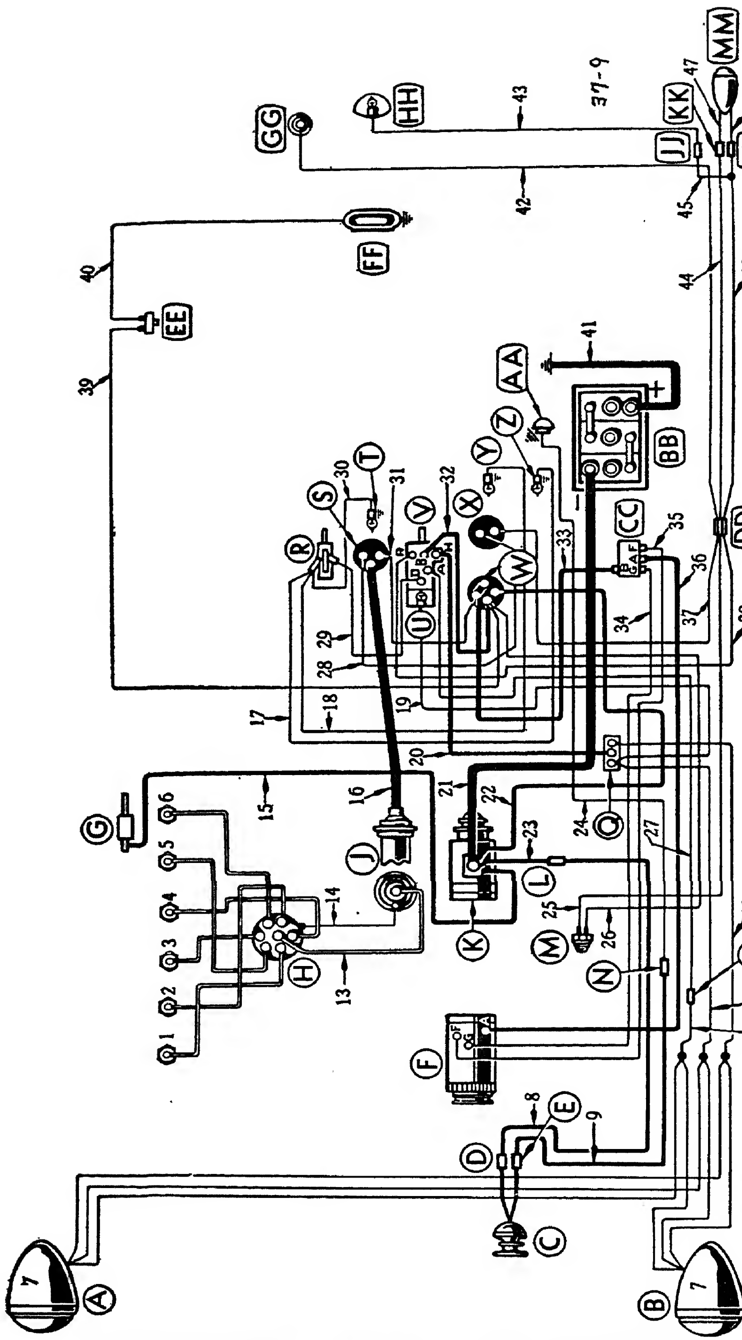
Cooling System Centrifugal **Type** Pump **Capacity** 2½ Gals.

Clutch Own **Facings** Moulded 6¼″ x 9″ x ⅛″ 2 Required

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Own Mechanical	**Front**	15¼″ x 1½″ x 3/16″
	Rear	15¼″ x 1½″ x 3/16″
	Hand	4 Wheels
	Lining	Moulded



CHRYSLER WIRING DIAGRAM, 1937, MODEL ROYAL 6
Courtesy of Chrysler Corporation

Chrysler **Model Royal 6** **Year 1937**

Battery Willard **Type** **Volts** 6–8 **Amps.** 105
Frame Connection Positive

Lighting **Head Lights** 6-8 Volts
Stop Light 6-8 Volts **Tail** 6-8 Volts
Parking Lights 6-8 Volts

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 22 Amps. Hot **Speed** 1900 R.P.M., Arm.
Regulation Voltage and Current **Cut-in** 7 Volts, 720 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 5° A.T.C.

Engine **Bore** 3⅜′ **Stroke** 4¼″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3⅜′ **Gap** Oil .005″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 50° A.B.C.
Intake Clearance Hot .006″ Operating, .014″ Timing
Exhaust Timing—Open 48° B.B.C. **Close** 2° A.B.C.
Exhaust Clearance Hot .010″ Operating, .014″ Timing

Carburetor Carter BB

Steering Caster 1½° Camber +¼° Toe-in 1/16″

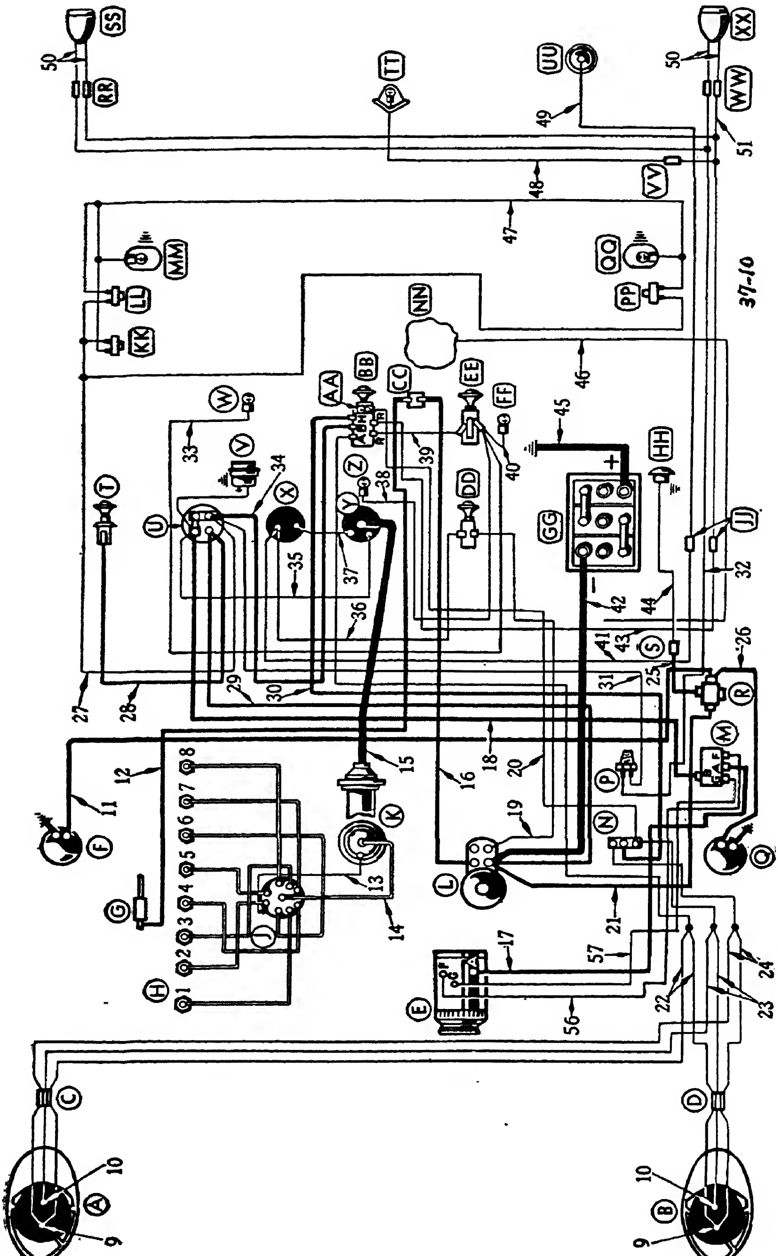
Cooling System Centrifugal **Type** Pump, Belt **Capacity** 20 Qts.

Clutch Borg & Beck **Facings** Woven 6″ x 10″ x ⅛″ 2 Required

Gear Ratio Ring Gear 41 Pinion 10 Hypoid Gears

Axle Own Semi-Floating

Brakes Lockheed Hydraulic
Front 19 13/16″ x 2″ x 13/64″ Clearance .006″ Heel, .012″ Toe
Rear 17 19/64″ x 2″ x 13/64″ Clearance .006″ Heel, .012″ Toe
Hand Transmission 16 15/16″ x 2″ x 5/32″ Clearance .025″
Lining Moulded Diagram 37-9



CHRYSLER WIRING DIAGRAM, 1937, MODEL AIRFLOW 8
Courtesy of Chrysler Corporation

Chrysler **Model Airflow 8** **Year 1937**

Battery Willard **Type** **Volts** 6-8 **Amps.** 136

Frame Connection Positive

Lighting

Head Lights 6-8 Volts

Stop Light 6-8 Volts **Tail** 6-8 Volts

Parking Lights 6-8 Volts

Starter and Generator Auto-Lite

Generator Auto-Lite

Max. Chg. Rate 28 Amps. Hot **Speed** 1700 R.P.M., Arm.

Regulation Voltage and Current **Cut-in** 7 Volts, 820 R.P.M.

Relay Air Gap **Contact Gap**

Ignition Auto-Lite

Contact Breaker Gap .013″

Spark Plug—Size 14 M.M. **Gap** .025″

Firing Order 1-6-2-5-8-3-7-4

Timing

Engine **Bore** 3¼ **Stroke** 4⅞″ **Taxable H.P.** 33.80

Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″

Diam. 3¼″ **Gap** Oil .007″ Comp. .007″

Oiling—Type Gear Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 2° B.T.C. **Close** 44° A.B.C.

Intake Clearance Hot .006″ Operating, .011″ Timing

Exhaust Timing—Open 46° B.B.C. **Close** 4° A.T.C.

Exhaust Clearance Hot .010″ Operating, .014″ Timing

Carburetor Stromberg

Steering Caster 2° Camber ½° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 17 Qts.

Clutch Borg & Beck **Facings** Woven 6⅛″ x 11″ x ⅛″ 2 Required

Gear Ratio Ring Gear 33 Pinion 10 Spiral Gears

Axle Own Semi-Floating

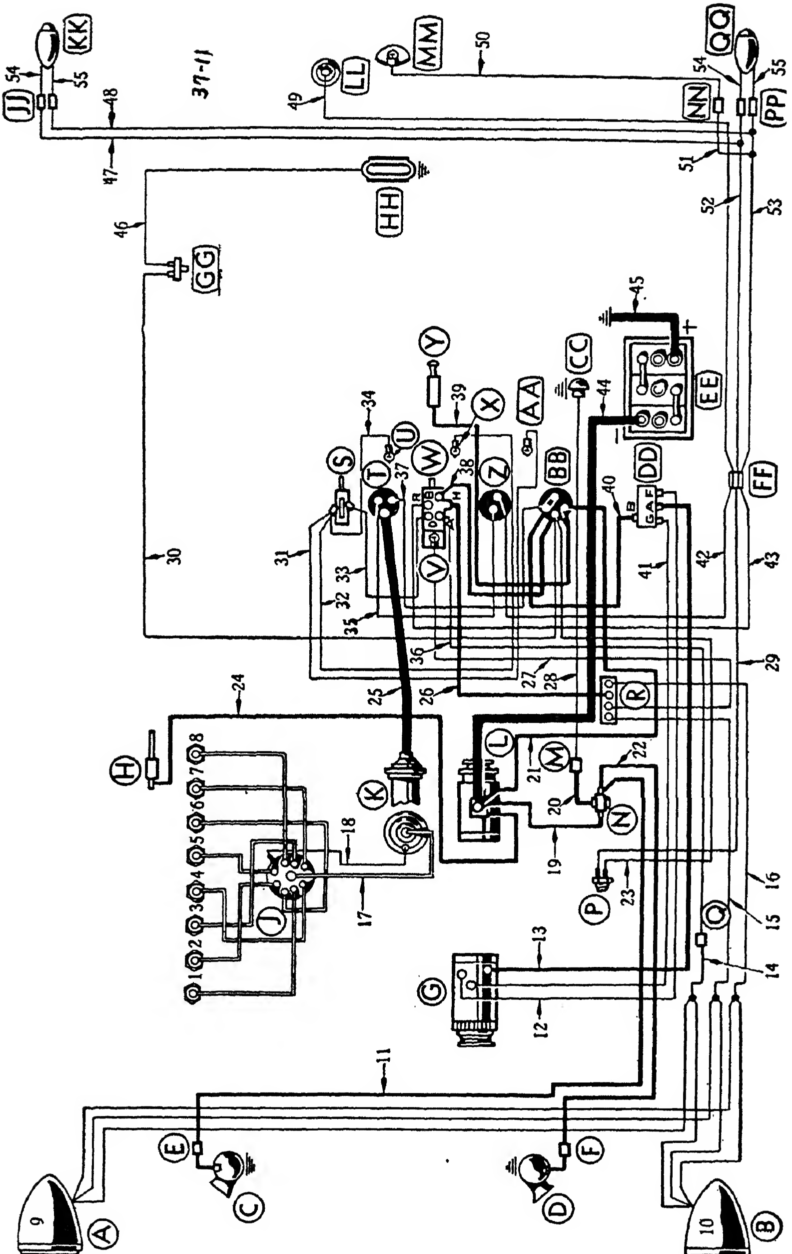
Brakes Lockheed Hydraulic

Front 24 27/32″ x 2″ x ¼″ Clearance .006″ Heel, .012″ Toe

Rear 24 27/32″ x 2″ x ¼″ Clearance .006″ Heel, .012″ Toe

Hand Transmission 21½″ x 2½″ x 3/16″ Clearance .025″

Lining Moulded Diagram 37-10



CHRYSLER WIRING DIAGRAM, 1937, MODEL IMPERIAL 8
Courtesy of Chrysler Corporation

Chrysler **Model Imperial 8** **Year 1937**

Battery Willard **Type** **Volts** 6-8 **Amps.** 119
Frame Connection Positive

Lighting **Head Lights** 6-8 Volts
Stop Light 6-8 Volts **Tail** 6-8 Volts
Parking Lights 6-8 Volts

Starter and Generator Auto-Lite

Generator Auto-Lite **Max. Chg. Rate** 28 Amps. Hot **Speed** 1700 R.P.M., Arm.
Regulation Voltage & Current **Cut-in** 7 Volts, 820 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite **Contact Breaker Gap** .013″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing

Engine **Bore** 3¼″ **Stroke** 4⅛″ **Taxable H.P.** 33.8
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3¼″ **Gap** Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 2° B.T.C. **Close** 44° A.B.C.
Intake Clearance Hot .006″ Operating, .011″ Timing
Exhaust Timing—Open 46° B.B.C. **Close** 4° A.T.C.
Exhaust Clearance Hot .010″ Operating, .014″ Timing

Carburetor Stromberg

Steering Caster 1½° Camber ¼° Toe-in 1/16″

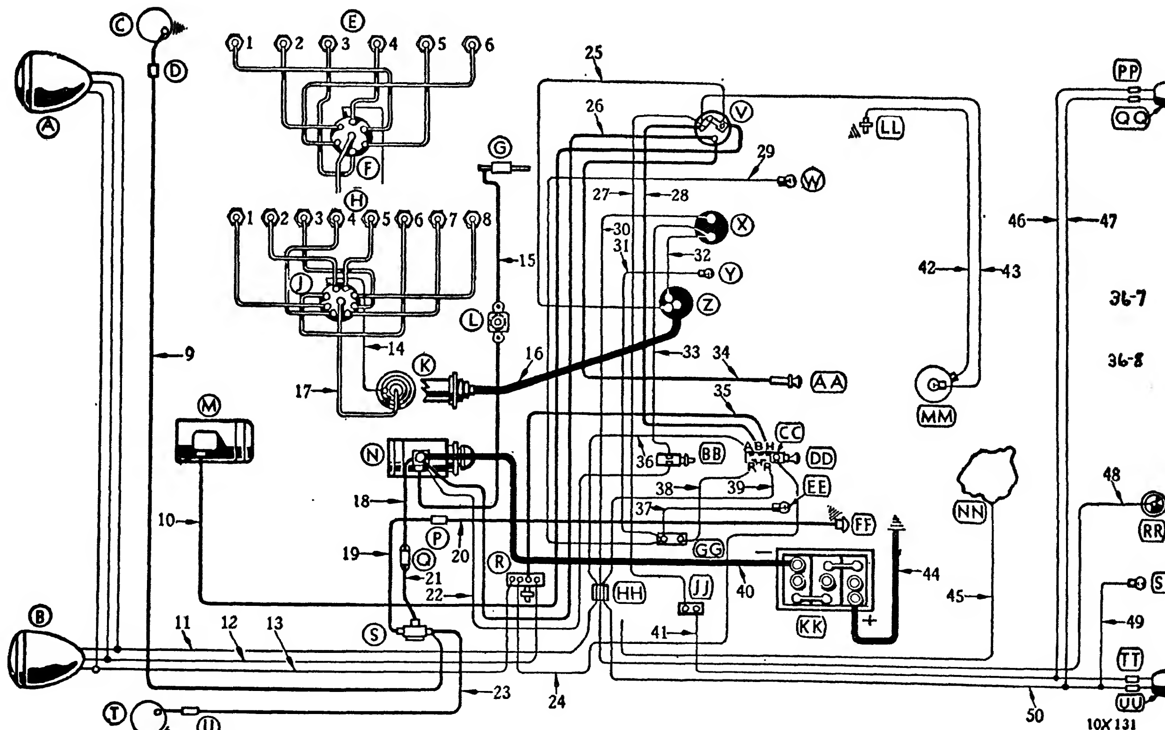
Cooling System Centrifugal **Type** Pump, Belt **Capacity** 22 Qts.

Clutch Borg & Beck **Facings** Woven 6″ x 10″ x ⅛″ 2 Required

Gear Ratio Ring Gear 41 Pinion 10 Hypoid Gears

Axle Own Semi-Floating

Brakes Lockheed Hydraulic
Front 22 5/32″ x 2″ x 13/64″ Clearance .006″ Heel, .012″ Toe
Rear 22 5/32″ x 2″ x 13/64″ Clearance .006″ Heel, .012″ Toe
Hand Transmission 21½″ x 2½″ x 3/16″ Clearance .025″
Lining Moulded Diagram 37-11



CHRYSLER WIRING DIAGRAM, 1936, MODEL, 6-CYLINDER
Courtesy of Chrysler Corporation

Chrysler **Model 6-Cylinder** **Year 1936**

Battery Willard **Type** **Volts** 6 **Amps.** 119
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 21-32 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 21 Amps. **Speed** 26 M.P.H.
Regulation 3rd Brush and Voltage Control **Cut-in** 6.5-7.3 Volts
Contact Gap .015″-.025″

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Engine **Bore** : **Stroke** 4½″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 2—$\frac{5}{32}$″ Comp. 2—⅛″
Diam. **Gap** .007″-.015″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 50° A.B.C.
Intake Clearance .006″ Hot, .010″ Cold
Exhaust Timing—Open 48° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance .008″ Hot, .010″ Cold

Carburetor Ball & Ball

Steering Caster 1½° Camber ¼° Toe-in $\frac{1}{16}$″

Cooling System Centrifugal **Type** Pump **Capacity** 4¾ Gals.

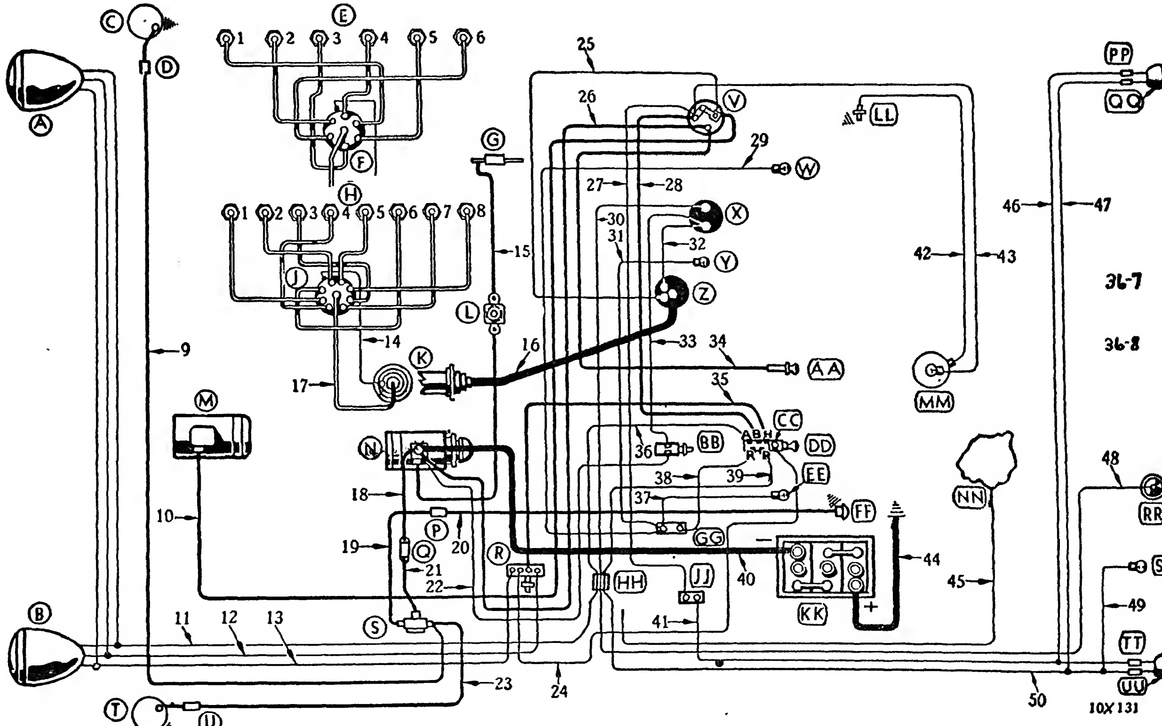
Clutch Borg & Beck **Facings** Woven 6¼″ x 9″ x ⅛″ 2 Required

Gear Ratio 4.1 to 1 Hypoid

Axle Semi-Floating

Brakes Lockheed Hydraulic
Front 24$\frac{27}{32}$″ x 2″ x ¼″ Clearance Toe .012″ Heel .006″
Rear 24$\frac{27}{32}$″ x 2″ x ¼″ Clearance Toe .012″ Heel .006″
Hand Transmission 21$\frac{13}{16}$″ x 2½″ x $\frac{3}{16}$″ Clearance $\frac{1}{32}$″

Lining Moulded Diagram 36-7



CHRYSLER WIRING DIAGRAM, 1936, MODEL, 8-CYLINDER

Courtesy of Chrysler Corporation

Chrysler **Model 8-Cylinder** **Year 1936**

Battery Willard **Type** **Volts** 6 **Amps.** 119
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 21-32 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 21 Amps. **Speed** 26 M.P.H.
Regulation 3rd Brush and Voltage Control **Cut-in** 6.5-7.3 Volts
Contact Gap .015″-.025″

Ignition Auto-Lite
Contact Breaker Gap .018″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing T.D.C.

Engine **Bore** 3¼″ **Stroke** 4⅛″ **Taxable H.P.** 33.80
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3¼″ **Gap** .007″-.015″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 2° B.T.C. **Close** 44° A.B.C.
Intake Clearance .006″ Hot, .012″ Cold
Exhaust Timing—Open 46° B.B.C. **Close** 4° A.T.C.
Exhaust Clearance .008″ Hot, .011″ Cold

Carburetor Stromberg

Steering Caster 1½° Camber ¼° Toe-in 1/16″

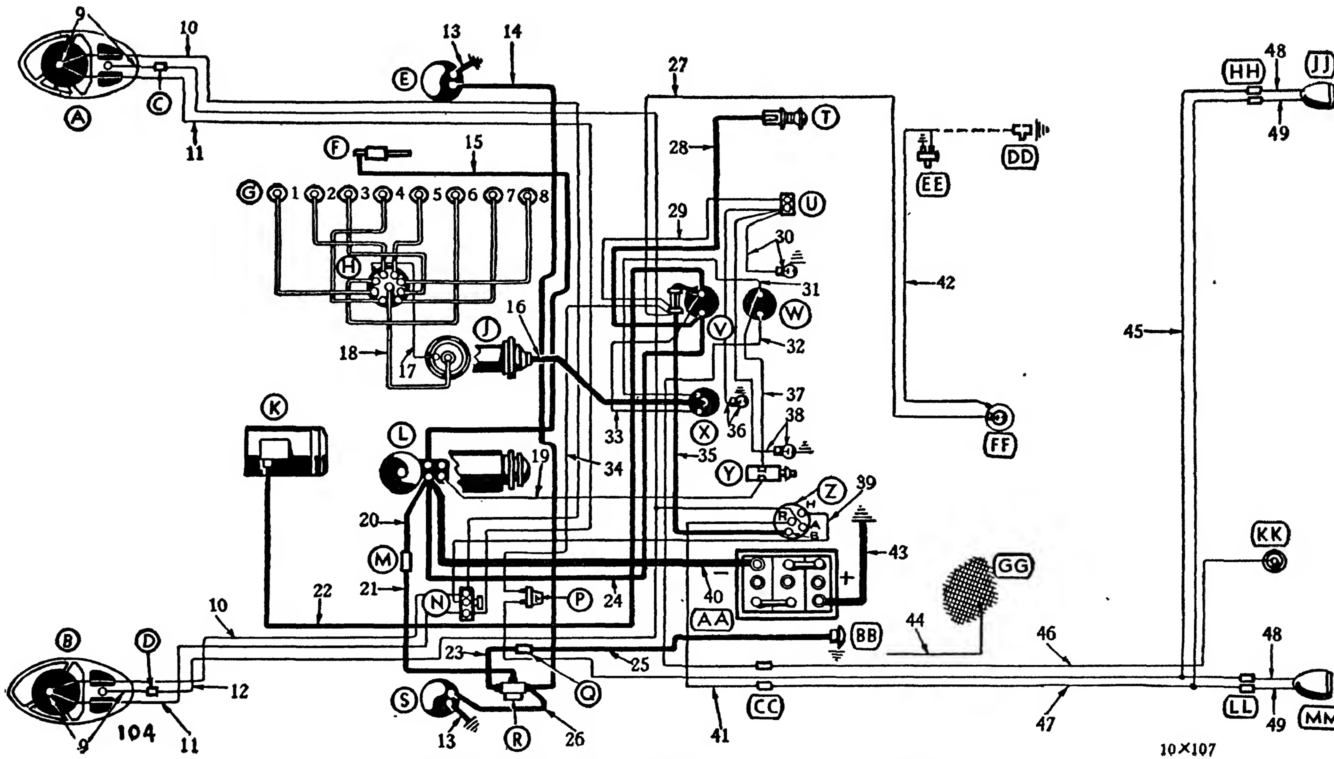
Cooling System Centrifugal **Type** Pump **Capacity** 5½ Gals.

Clutch Borg & Beck **Facings** Woven 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio 4.1 to 1 Hypoid

Axle Semi-Floating

Brakes Lockheed Hydraulic
Front 22 5/32″ x 2″ x 3/16″ Clearance Toe .012″ Heel .006″
Rear 22 5/32″ x 2″ x 3/16″ Clearance Toe .012″ Heel .006″
Hand Transmission 18 13/32″ x 2″ x 5/32″ Clearance 1/16″
Lining Moulded Diagram 36-8



CHRYSLER WIRING DIAGRAM, 1935, MODEL AIRFLOW 8

Courtesy of Chrysler Corporation

Chrysler **Model Airflow 8** **Year 1935**

Battery Willard **Type** **Volts** 6 **Amps.** 136
Frame Connection

Lighting Mazda 2320-C **Head Lights** 6-8, 21-32 C.P.
Mazda 63, 1158 **Dash, Tail and Stop** 6-8, 3-3-21 C.P.
Mazda 55 **Side Lights** 6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator **Max. Chg. Rate** 21 Amps. **Speed**
Regulation 3rd Brush **Cut-in** 6.5-7.3 Volts
Relay Air Gap **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing

Engine **Bore** 3¼″ **Stroke** 4⅞″ **Taxable H.P.** 33.80
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3¼″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 2° B.T.C. **Close** 44° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 46° B.B.C. **Close** 4° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Stromberg

Steering Caster ½° Camber 2° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump **Capacity** 4¾ Gals.

Clutch Borg & Beck **Facings** 6⅛″ x 11″ x .133″ 2 Required

Gear Ratio Ring Gear 41 Pinion 10 Spiral Gears

Axle Own Semi-Floating

Brakes Hydraulic Lockheed
Front 24 7/32″ x 2″ x ¼″ Clearance Heel .006″, Toe .012″
Rear 24 7/32″ x 2″ x ¼″ Clearance Heel .006″, Toe .012″
Hand Transmission 21 13/16″ x 2½″ x 3/16″ Clearance 1/16″
Lining Woven

Diagram 104

Chrysler Models 6-Cylinder, CA and CB Year 1934

Battery Willard **Type** WH-2-15 **Volts** 6 **Amps.** 119
Frame Connection Positive

Lighting Mazda A-1116 **Head Lights** 6-8, 32-21 C.P.
Mazda 63-1158 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 12-15 Amps. **Speed** 2900 R.P.M.
Regulation 3rd Brush **Cut-in** 6.6-6.8 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 14 MM. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing Standard Head T.D.C. H.C. Head 3° A.T.C.

Engine **Bore** 3⅜″ **Stroke** 4½″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 1—³⁄₁₆″ Comp. 3—⅛″
Diam. 3⅜″ **Gap** Oil .007″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 50° A.B.C.
Intake Clearance .005″ Hot
Exhaust Timing—Open 48° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance .007″ Hot

Carburetor Stromberg Ball & Ball

Cooling System Centrifugal **Type** Pump **Capacity**

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x .133″ 2 Required

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Lockheed Hydraulic **Front** 22⁵⁄₃₂″ x 2″ x ³⁄₁₆″ Clearance Heel .006″ Toe .012″
Rear 22⁵⁄₃₂″ x 2″ x ³⁄₁₆″ Clearance Heel .006″ Toe .012″
Hand Transmission 18¹³⁄₃₂″ x 2″ x ⁵⁄₃₂″ Clearance ¹⁄₁₆″

Lining Moulded

Chrysler Models 8-Cylinder, Airflow CU and Imperial CV Year 1934

Battery Willard **Type** WH-4-17 **Volts** 6 **Amps.** 136
Frame Connection Positive

Lighting Mazda 2320-C **Head Lights** 6-8, 32-21 C.P.
Mazda 63, 87 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 12-15 Amps. **Speed** 2900 R.P.M.
Regulation 3rd Brush **Cut-in** 6.6-6.8 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″
Spark Plug—Size 14 MM. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing T.D.C.

Engine **Bore** CU, 3¼″; CV, 3½″; **Stroke** CU, 4½″; CV, 5″ **Taxable H.P.** 33.80
Piston Ring—Width Oil 1—3/16″ Comp. 3—⅛″ and 4—5/32″
Diam. as Bore **Gap** .007″ on All
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 2° A.T.C. **Close** 44° A.B.C.
Intake Clearance .005″
Exhaust Timing—Open 46° B.B.C. **Close** 4° A.T.C.
Exhaust Clearance .007″

Carburetor Stromberg

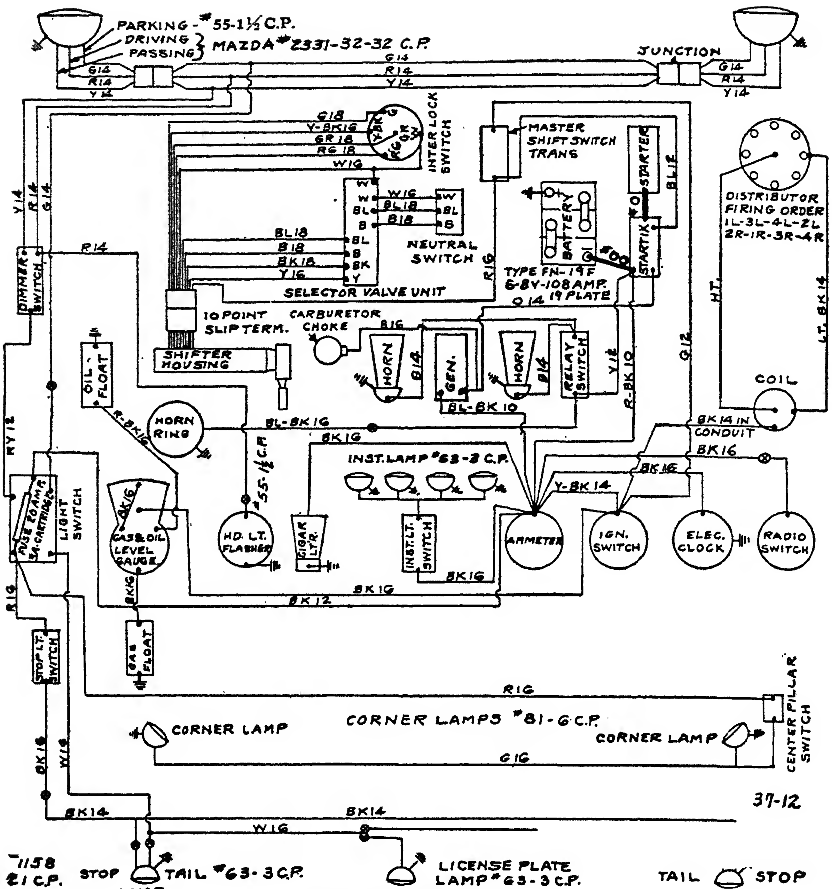
Cooling System Centrifugal **Type** Pump **Capacity**

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x .133″ 2 Required

Gear Ratio Ring Gear 41 Pinion 10 Spiral Gears

Axle Own Semi-Floating

Brakes Lockheed Hydraulic
Front CU, 22 13/16″ x 2″ x ¼″ Clearance Heel .006″ Toe .012″
CV, 24 27/32″ x 2″ x ¼″ Clearance Heel .006″ Toe .012″
Rear Same as Front
Hand Transmission 18¼″ x 2½″ x ¼″ Clearance 1/16″
Lining Moulded



COLOR CHART

B—Brown
Y—Yellow
R—Red
W—White
BK—Black

O—Oak
BL—Blue
R-BK—Red & Black Tracer
BL-BK—Blue & Black Tracer
Y-BK—Yellow & Black Tracer

GR—Green & Red Tracer
RG—Red & Green Tracer
G—Green
RY—Red & Yellow Tracer

Douglas Junctions are indicated by × in a circle.

CORD WIRING DIAGRAM, 1937, 8-CYLINDER
Courtesy of Auburn Motor Company

Cord **Model 8-Cylinder** **Year 1937**

Battery U.S.L. **Type** FN-19F **Volts** 6-8 **Amps.** 108
Frame Connection Positive

Lighting
Head Lights 6-8 Volts
Stop Light 6-8 Volts **Tail** 6-8 Volts
Parking Lights 6-8 Volts

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 23 Amps. Hot **Speed** 2800 R.P.M., Arm.
Regulation Current Control **Cut-in** 6.5 Volts, 720 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .017″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1L-3L-4L-2L-2R-1R-3R-4R
Timing 3° B.T.C.

Engine Bore 3½″ **Stroke** 3¾″ **Taxable H.P.** 39.20
Piston Ring—Width Oil 2—5/32″ Comp. 2—3/32″
Diam. 3½″ **Gap** Oil .009″ Comp. .009″
Oiling—Type Gear Pump **Capacity** 7 Qts. **Pressure** 40 Lbs. Max.

Valves **Intake Timing—Open** 7½° B.T.C. **Close** 37½° A.B.C.
Intake Clearance Hot .008″ Operating, .016″ Timing
Exhaust Timing—Open 50° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance Hot .008″ Operating, .016″ Timing

Carburetor Stromberg EE15

Steering Caster 1° Camber 1° Toe-in 0″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 28 Qts.

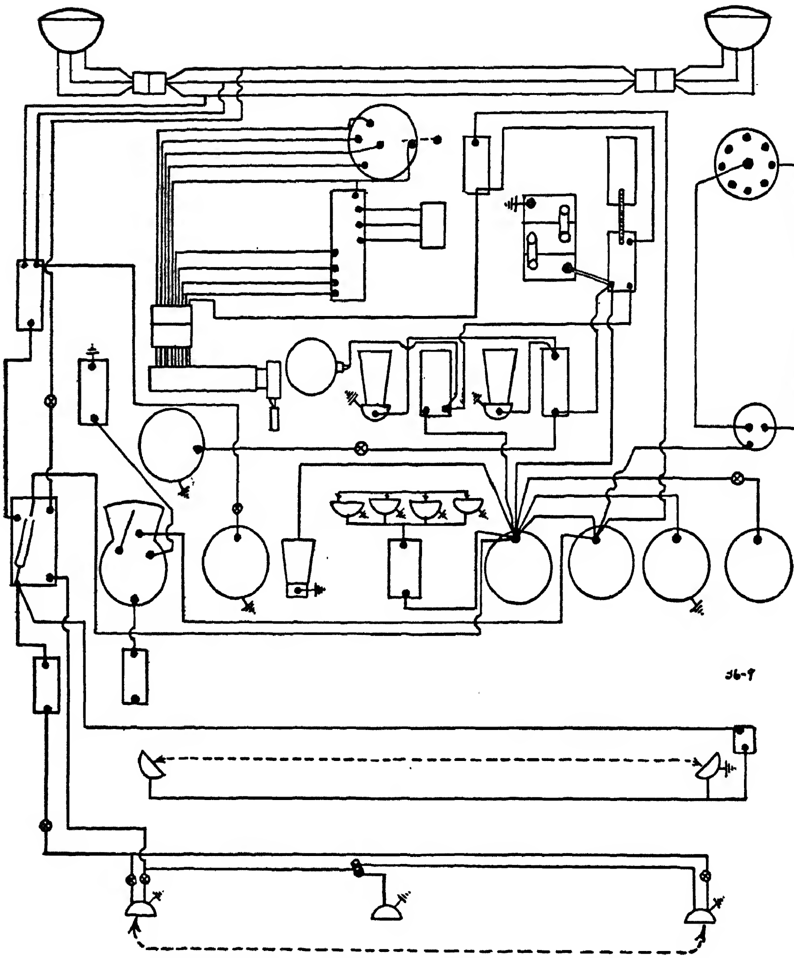
Clutch Long **Facings** Woven 6″ x 10″ x .137″ 2 Required

Gear Ratio Ring Gear 47 Pinion 10 Spiral Gears

Axle Own Tubular Front-Wheel Drive

Brakes Bendix Hydraulic
Front 24″ x 2¼″ x 3/16″ Clearance .010″
Rear 24″ x 2¼″ x 3/16″ Clearance .010″
Hand Rear Service

Lining Moulded and Woven **Diagram 37-12**



CORD WIRING DIAGRAM, 1936, MODEL, 8-CYLINDER
Courtesy of Auburn Motor Company

Cord **Model 8-Cylinder** **Year 1936**

Battery U.S.L. **Type** **Volts** 6 **Amps.** 125
Frame Connection

Lighting
Head Lights
Stop Light **Tail**
Parking Lights

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 20 Amps. Hot **Speed** 2500 R.P.M.
Regulation **Cut-in** 6.5 Volts
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1L-3L-4L-2L-2R-1R-3R-4R
Timing 3° B.T.C. Retard

Engine **Bore** 3½″ **Stroke** 3¾″ **Taxable H.P.** 39.20
Piston Ring—Width Oil 1—⅛″, 1—$\frac{3}{16}$″ **Comp.** $\frac{3}{32}$″
Diam. 3½″ **Gap** .014″
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 7.5° B.T.C. **Close** 37.5° A.B.C.
Intake Clearance .010″ Hot
Exhaust Timing—Open 50° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .010″ Hot

Carburetor Stromberg

Steering

Cooling System Pump **Type** Centrifugal **Capacity** 28 Qts.

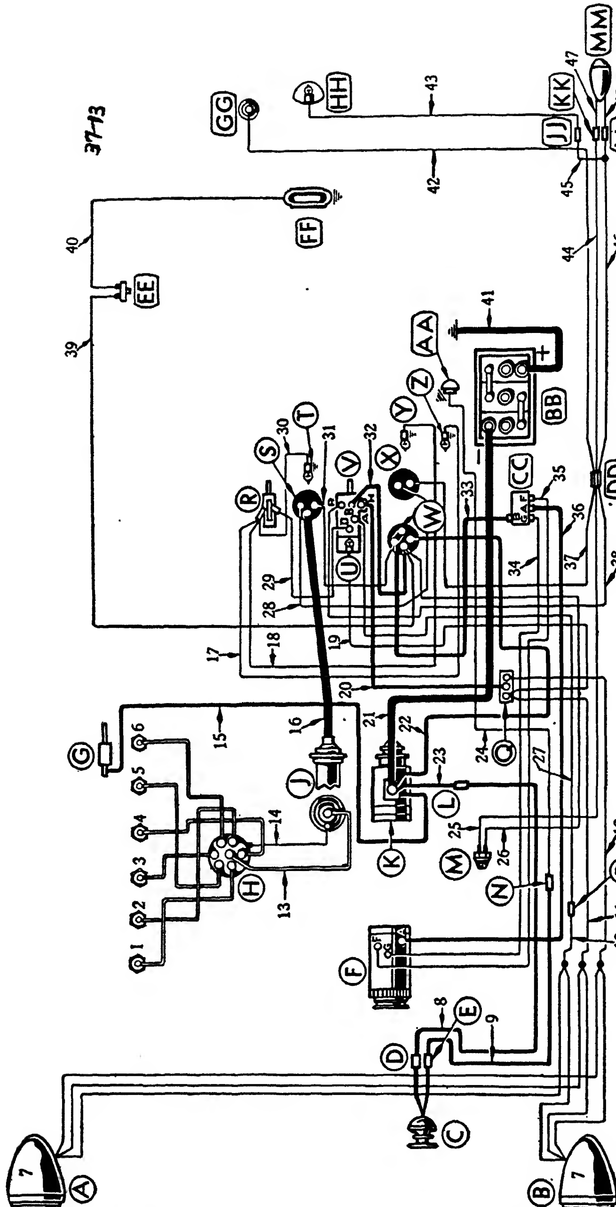
Clutch Long **Facings** Woven 6″ x 10″ x .137″ 2 Required

Gear Ratio 4.1 to 1

Axle Own Semi-Floating

Brakes Lockheed Hydraulic
Front 19″ x 2¼″ x $\frac{3}{16}$″
Rear 19″ x 2¼″ x $\frac{3}{16}$″
Hand

Lining Moulded **Diagram** 36-9



DeSOTO WIRING DIAGRAM, 1937, 6-CYLINDER
Courtesy of Chrysler Corporation

De Soto **Model 6-Cylinder** **Year 1937**

Battery Willard **Type** **Volts** 6-8 **Amps.** 105
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P.
Mazda 1158 **Stop Light** 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Mazda 55 **Parking Lights** 6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 22 Amps. Hot **Speed** 1900 R.P.M., Arm.
Regulation Voltage and Current **Cut-in** 7 Volts, 720 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 2° A.T.C.

Engine **Bore** 3⅜″ **Stroke** 4¼″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3⅜″ **Gap** Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 50° A.B.C.
Intake Clearance Hot .006″ Operating, .014″ Timing
Exhaust Timing—Open 48° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance Hot .010″ Operating, .014″ Timing

Carburetor Carter BB

Steering Caster 1½° Camber ¼° Toe-in 1/16″

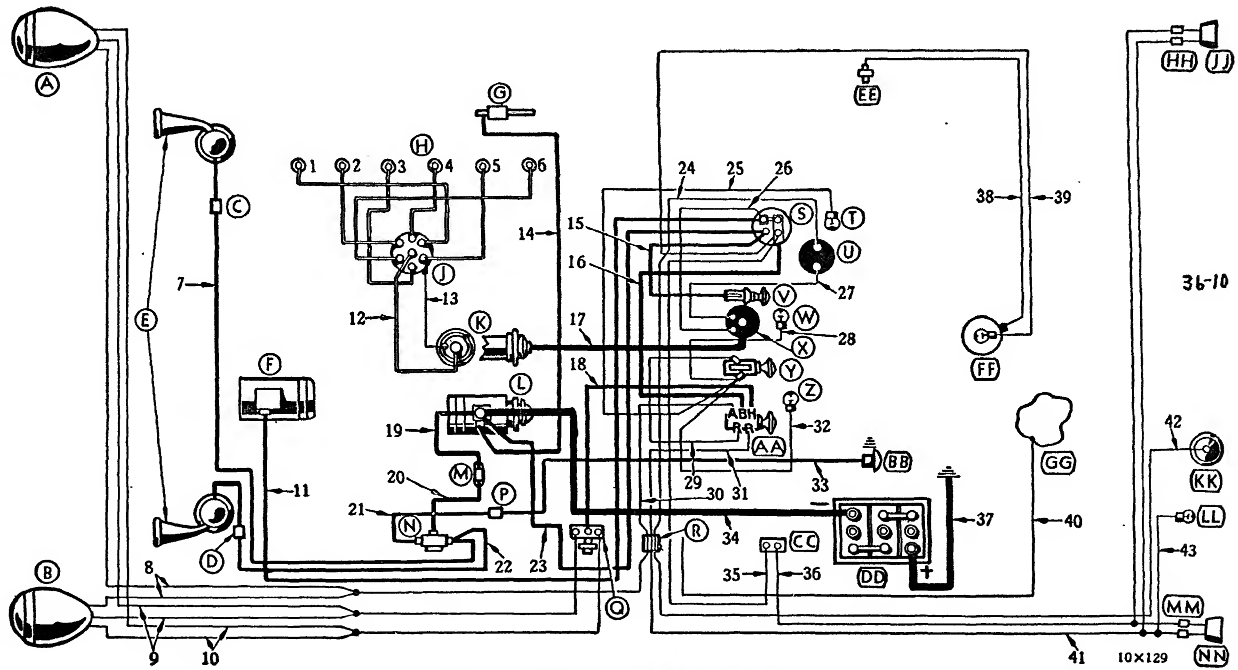
Cooling System Centrifugal **Type** Pump, Belt **Capacity** 20 Qts.

Clutch Borg & Beck **Facings** Woven 6″ x 10″ x ⅛″ 2 Required

Gear Ratio Ring Gear 41 Pinion 10 Hypoid Gears

Axle Own Semi-Floating

Brakes Lockheed Hydraulic
Front 19 13/16″ x 2″ x 13/64″ Clearance .006″ Heel, .012″ Toe
Rear 17 19/64″ x 2″ x 13/64″ Clearance .006″ Heel, .012″ Toe
Hand Transmission 16 15/16″ x 2″ x 5/32″ Clearance .025″
Lining Moulded Diagram 37-13



DE SOTO WIRING DIAGRAM, 1936, MODEL SI

Courtesy of Chrysler Corporation

De Soto Model SI Year 1936

Battery Willard **Type** **Volts** 6 **Amps.** 119
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 21-32 C.P.
Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 1½″ C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 21 Amps. **Speed** 27 M.P.H.
Regulation 3rd Brush and Voltage Control **Cut-in** 6.5 Volts
Contact Gap .015″-.025″

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing T.D.C. Retarded

Engine **Bore** : **Stroke** 4½″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 2—5/32″ **Comp.** 2—⅛″
Diam. 3⅜″ **Gap** .007″-.015″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 50° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 48° B.D.C. **Close** 2° A.T.C.
Exhaust Clearance .008″ Exhaust

Carburetor Ball & Ball

Steering Caster 1½° Camber ¼° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump **Capacity** 4¾ Gals.

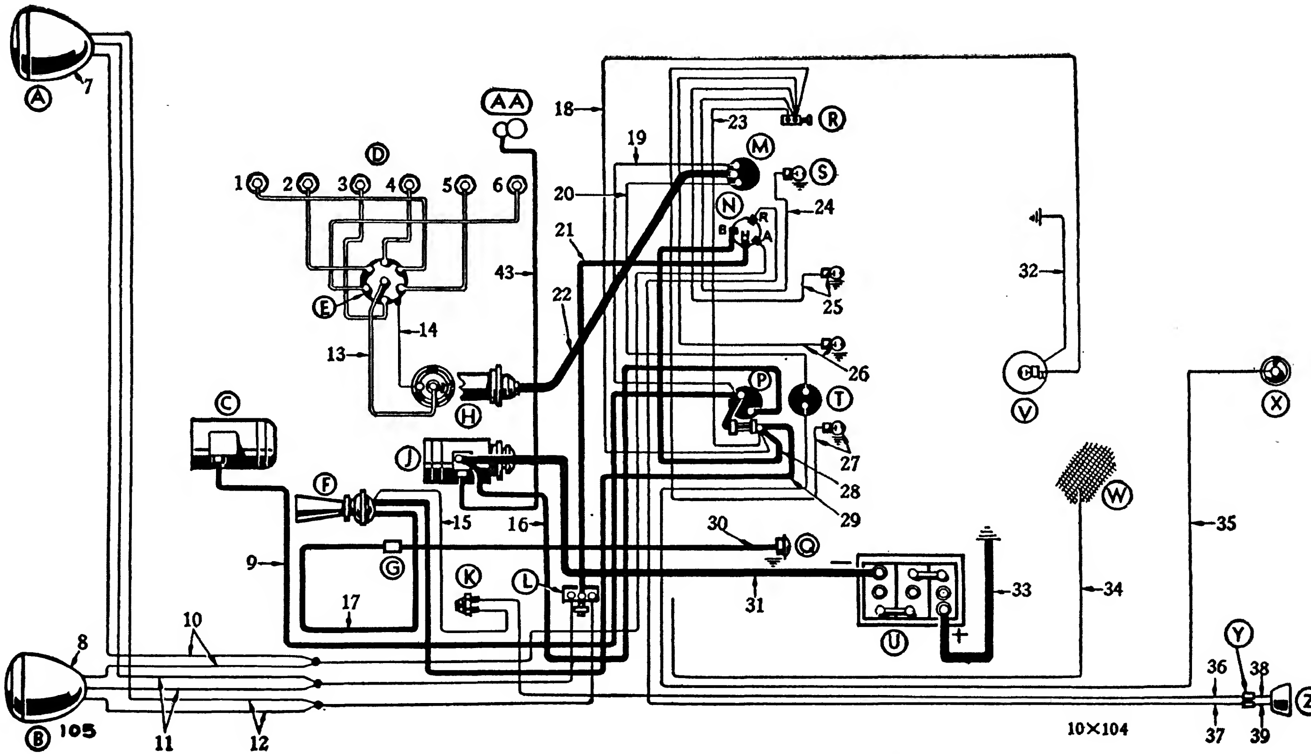
Clutch Borg & Beck **Facings** Woven 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio 4.1 to 1 Hypoid

Axle Semi-Floating

Brakes Lockheed Hydraulic
Front 22 5/32″ x 2″ x 3/16″ Clearance Toe .012″ Heel .006″
Rear 22 5/32″ x 2″ x 3/16″ Clearance Toe .012″ Heel .006″
Hand Transmission 24 3/16″ x 2″ x ¼″ Clearance 1/16″

Lining Moulded Diagram 36-10



DE SOTO WIRING DIAGRAM, 1935, MODEL AIRSTREAM 6
Courtesy of Chrysler Corporation

De Soto **Model Airstream 6** **Year 1935**

Battery Willard **Type** **Volts** 6 **Amps.** 119

Frame Connection Positive

Lighting	Mazda 2320-C	**Head Lights**	6-8, 21-32 C.P.
	Mazda 63, 1158	**Dash, Tail and Stop**	6-8, 3-3-21 C.P.
	Mazda 55	**Side Lights**	6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator **Max. Chg. Rate** **Speed**
Regulation 3rd Brush **Cut-in** 6.5-7.3 Volts
Relay Air Gap **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .020″
Spark Plug—**Size** 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 5° A.T.C.

Engine **Bore** **Stroke** 4½″ **Taxable H.P.** 27.34
Piston Ring—**Width Oil** 2—5/32″ **Comp.** 2—⅛″ **Diam.** 3⅜″ **Gap**
Oiling—**Type** Pump **Capacity** 6 Qts.

Valves **Intake Timing**—**Open** T.D.C. **Close** 50° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—**Open** 48° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Ball & Ball

Steering Caster 1° Camber ¼° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump **Capacity** 4¼ Gals.

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x .133″ 2 Required

Gear Ratio Ring Gear 35 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Hydraulic
- **Front** 19 13/16″ x 2″ x 3/16″ Clearance Heel .006″ Toe .012″
- **Rear** 19 13/16″ x 2″ x 3/16″ Clearance Heel .006″ Toe .012″
- **Hand** Transmission 18 13/32″ x 2″ x 3/16″

Lining Woven

Diagram 105

De Soto **Model, Airflow SE 6-Cylinder** **Year 1934**

Battery Willard **Type** WS-4-17 **Volts** 6 **Amps.** 115
Frame Connection Positive

Lighting Mazda 2320-C **Head Lights** 6-8, 32-21 C.P.
Mazda 63, 1158 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 12-15 Amps. **Speed** 2900 R.P.M.
Regulation 3rd Brush **Cut-in** 6.6-6.8 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 14 MM. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 3° A.T.C.

Engine **Bore** : **Stroke** 4½″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 1—3/16″ Comp. 3—⅛″
Diam. 3⅜″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 50° A.B.C.
Intake Clearance .005″ Hot
Exhaust Timing—Open 40° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance .007″ Hot

Carburetor Ball & Ball

Cooling System Centrifugal **Type** Pump **Capacity**

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x .133″ 2 Required

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Lockheed Hydraulic
- **Front** 22 5/32″ x 2″ x 3/16″ Clearance Heel .006″ Toe .012″
- **Rear** 22 5/32″ x 2″ x 3/16″ Clearance Heel .006″ Toe .012″
- **Hand** Transmission 18¼″ x 2½″ x ¼″ Clearance 1/16″

Lining Moulded

De Soto Model SD Year 1933

Battery Willard **Type** WT-1-15 **Volts** 6 **Amps.** 90

Frame Connection Positive

Lighting Double Contact **Head Lights** 6-8, 32-21 C.P.

Single Contact **Dash & Tail** 6-8, 3-2 C.P. **Stop** 21 C.P.

Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 12-14 Amps. **Speed** 2800-3000 R.P.M.

Regulation 3rd Brush, Thermo. **Cut-in** 6.75-7.5 Volts

Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″

Spark Plug—Size 14 M.M. **Gap** .025″

Firing Order—1-5-3-6-2-4

Timing Silver Dome 622-C 9° B.T.D.C.

Red Head 622-C 7° B.T.D.C.

Silver Dome 644-J At T.D.C.

Red Head 644-J 6° A.T.D.C.

Engine **Bore** 3-1/4″ **Stroke** 4-3/8″ **Taxable H.P.** 25.35

Piston Ring—Width 1-1/8″, 1-5/32″, 2-9/64″ **Diam.** 3-1/4″ **Gap** All Rings .007″

Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 46° A.B.C.

Intake Clearance .005″ Hot

Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.

Exhaust Clearance .007″ Hot

Carburetor Ball & Ball

Cooling System—Centrifugal **Type** Pump **Capacity** 4 Gals.

Clutch Borg & Beck **Facing**—Moulded 9-7/8″ x 6-3/4″ x 1/8″

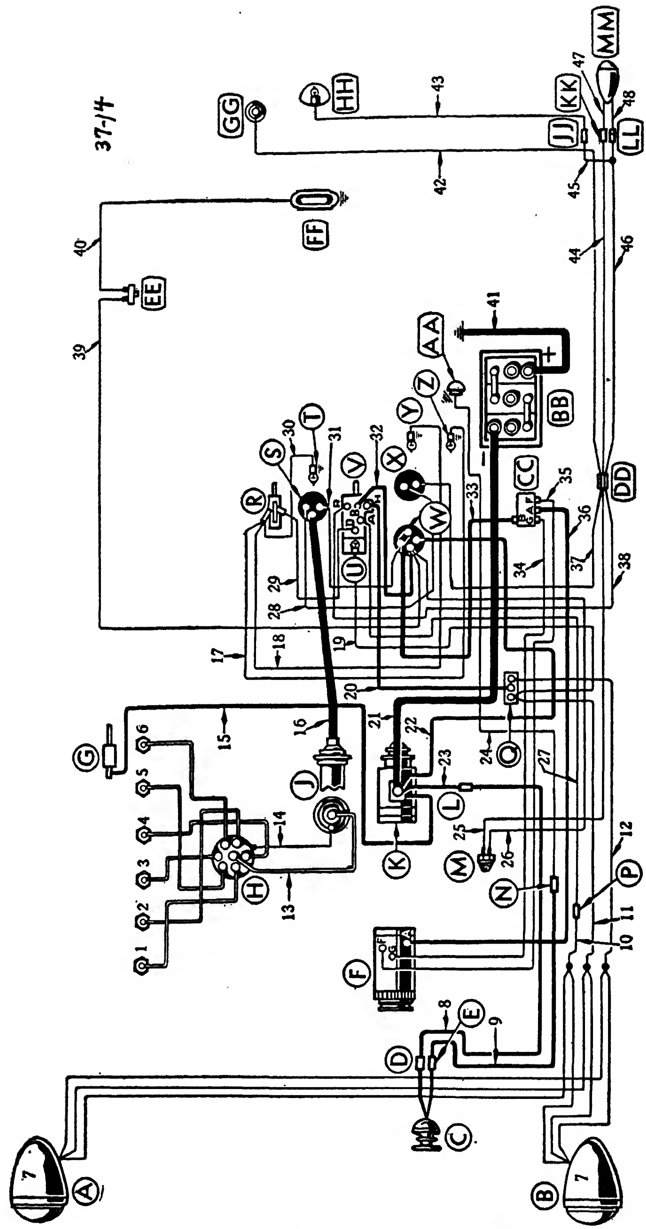
Gear Ratio Ring Gear 35 Pinion 8 Spiral Gears

Axle Own Semi-Floating

				Heel	Toe
Brakes Lockheed Hydraulic	**Front**	20-7/32″ x 1-1/2″ x 3/16″	Clearance	.006″	.012″
	Rear	20-7/32″ x 1-1/2″ x 3/16″	Clearance	.006″	.012″

Hand Trans. 21-13/32″ x 2″ x 5/32″ Clearance 1/16″

Lining—Moulded



DODGE WIRING DIAGRAM, 1937, 6-CYLINDER
Courtesy of Chrysler Corporation

Dodge **Model 6-Cylinder** **Year 1937**

Battery Willard **Type** **Volts 6-8** **Amps. 95**

Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P.

Mazda 1158 **Stop Light** 6-8, 21 C.P. **Tail** 6-8, 3 C.P.

Mazda 55 **Parking Lights** 6-8, 1.5 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 22 Amps. Hot **Speed** 1900 R.P.M., Arm.
Regulation Voltage and Current **Cut-in** 7 Volts, 720 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 4° A.T.C.

Engine **Bore** $3\frac{1}{4}''$ **Stroke** $4\frac{3}{8}''$ **Taxable H.P.** 25.35

Piston Ring—Width Oil 2—$\frac{5}{32}''$ Comp. 2—$\frac{1}{8}''$
Diam. $3\frac{1}{4}''$ **Gap** Oil .007″ Comp. .007″

Oiling—Type Gear Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 46° A.B.C.
Intake Clearance Hot .006″ Operating, .011″ Timing
Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.
Exhaust Clearance Hot .008″ Operating, .012″ Timing

Carburetor Stromberg

Steering Caster 2° Camber $\frac{1}{2}$° Toe-in $\frac{1}{16}''$

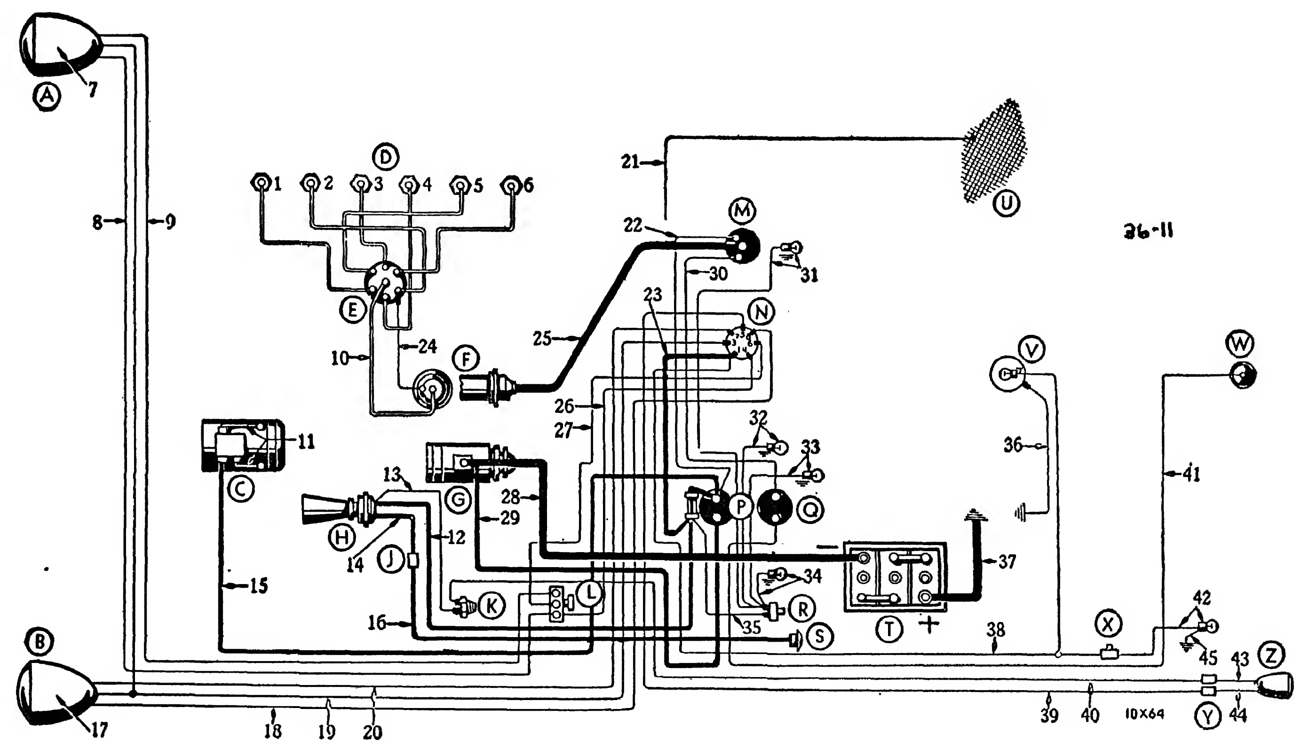
Cooling System Centrifugal **Type** Pump, Belt **Capacity** 20 Qts.

Clutch Borg & Beck **Facings** Woven 6″ x 10″ x $\frac{1}{8}''$ 2 Required

Gear Ratio Ring Gear 41 Pinion 10 Hypoid Gears

Axle Own Semi-Floating

Brakes Lockheed Hydraulic
Front $19\frac{13}{16}''$ x 2″ x $\frac{13}{64}''$ Clearance .006″ Heel, .012″ Toe
Rear $17\frac{19}{64}''$ x 2″ x $\frac{13}{64}''$ Clearance .006″ Heel, .012″ Toe
Hand Transmission $16\frac{15}{16}''$ x 2″ x $\frac{5}{32}''$ Clearance .025″
Lining Moulded Diagram 37-14



DODGE ʼRING DIAGRAM, 1936, MODEL, 6-CYLIND.

Courtesy of Chrysler Corporation

Dodge **Model 6-Cylinder** **Year 1936**

Battery Willard **Type** **Volts 6** **Amps. 90**

Frame Connection Positive

Lighting Mazda 2320 **Head Lights** 6-8, 21-32 C.P.

Stop Light 6-8, 21 C.P. **Tail** 6-8, 3 C.P.

Parking Lights 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite **Max. Chg. Rate** 18 Amps. **Speed** 26 M.P.H.

Regulation 3rd Brush and Voltage Control **Cut-in** 7 Volts

Contact Gap .015″-.025″

Ignition **Contact Breaker Gap** .020″

Spark Plug—Size 14 M.M. **Gap** .025″

Firing Order 1-5-3-6-2-4

Timing .002″ A.T.C. Piston Movement

Engine **Bore** 3¼″ **Stroke** 4⅜″ **Taxable H.P.** 25.35

Piston Ring—Width Comp. 3 1—⅛″, 2—9/64″

Diam. 3¼″ **Gap** .007″-.015″

Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 46° A.B.C.

Intake Clearance .006″ Hot

Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.

Exhaust Clearance .008″ Hot

Carburetor Stromberg EXV2

Steering Caster 1½° Camber ½° Toe-in 1/16″ to ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 4⅝ Gals.

Clutch Borg & Beck **Facings** Moulded and Woven 1 of Each 6⅛″ x 9⅞″ x ⅛″ 6⅛″ x 9⅞″ x .133″

Gear Ratio 4.11 to 1 Spiral Gears

Axle Semi-Floating

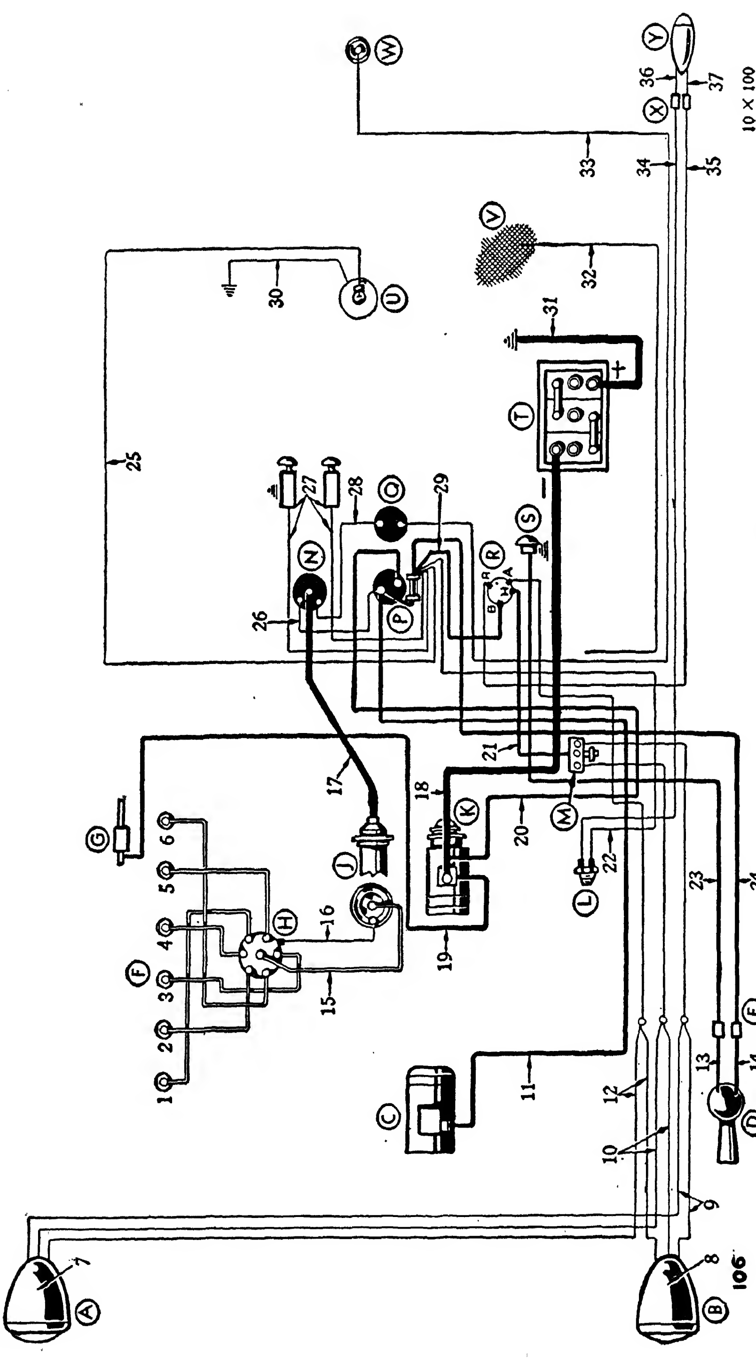
Brakes Lockheed Hydraulic

Front 19 13/16″ x 2″ x 5/16″ Clearance Toe .012″ Heel .006″

Rear 19 13/16″ x 2″ x 5/16″ Clearance Toe .012″ Heel .006″

Hand Transmission 16½″ x 3″ x ¼″ Clearance .025″

Lining Moulded Diagram 36-11



DODGE WIRING DIAGRAM, 1935
Courtesy of Chrysler Corporation

Dodge **Model** **Year 1935**

Battery Willard **Type** **Volts 6** **Amps. 90**

Frame Connection Positive

Lighting Mazda 2320-C **Head Lights** 6-8, 32-21 C.P.

Mazda 55, 1158 **Dash, Tail and Stop** 6-8, 3-3-21 C.P.

Mazda 55 **Side Lights** 6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator **Max. Chg. Rate** 21 Amps. **Speed**

Regulation 3rd Brush **Cut-in** 6.5-7.3 Volts

Relay Air Gap **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .020″

Spark Plug—Size 14 M.M. **Gap** .025″

Firing Order 1-5-3-6-2-4

Timing 3° A.T.C. Retard

Engine **Bore** 3¼″ **Stroke** 4⅜″ **Taxable H.P.** 25.35

Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″

Diam. 3¼″ **Gap** .007″ on All

Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 46° A.T.C.

Intake Clearance .006″ Hot

Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.

Exhaust Clearance .008″ Hot

Carburetor Stromberg EX22

Steering Caster 2° Camber ½° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump **Capacity** 4¾ Gals.

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x .133″ 2 Required

Gear Ratio Ring Gear 33 Pinion 8 Spiral Gears

Axle Own Semi-Floating

Brakes Hydraulic Lockheed **Front** 19 21/32″ x 2″ x 3/16″ Clearance Heel .005″ Toe .010″

Rear 19 21/32″ x 2″ x 3/16″ Clearance Heel .005″ Toe .010″

Hand Transmission 18 13/32″ x 2″ x 5/32″ Clearance 1/16″

Lining Moulded

Diagram 106

Dodge Models 6-Cylinder, DR and DS Year 1934

Battery Willard **Type** WT-1-15 **Volts** 6 **Amps.** 90
Frame Connection Positive

Lighting Mazda 2320-C **Head Lights** 6-8, 32-21 C.P.
Mazda 63, 1158 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 12-15 Amps **Speed** 2600 R.P.M.
Regulation 3rd Brush **Cut-in** 6.6-6.8 Volts
Relay Air Gap .038″ **Contact Gap** .008″-.013″

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 14 MM. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing Cast Iron Head 2° A.T.C. Aluminum Head 4° A.T.C

Engine **Bore** 3¼″ **Stroke** 4⅜″ **Taxable H.P.** 25.32
Piston Ring—Width Oil 1—5/32″; Comp. 2—9/64″, 1—⅛″
Diam. 3¼″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 46° A.B.C.
Intake Clearance .005″ Hot
Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.
Exhaust Clearance .007″ Hot

Carburetor Stromberg

Cooling System Centrifugal **Type** Pump **Capacity**

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x .133″ 2 Required

Gear Ratio Ring Gear 35 Pinion 8 Spiral Gears

Axle Own Semi-Floating

Brakes Lockheed Hydraulic
Front 15 25/32″ x 2″ x 3/16″ Clearance Heel .006″ Toe .012″
Rear 15 25/32″ x 2″ x 3/16″ Clearance Heel .006″ Toe .012″
Hand Transmission 18 13/32″ x 2″ x 5/32″ Clearance 1/16″

Lining Moulded

Dodge Model DO Year 1933

Battery Willard **Type** WS-4-17 **Volts** 6 **Amps.** 115
Frame Connection Positive

Lighting Double Contact **Head Lights** 6-8, 32-21 C.P.
Single Contact **Dash & Tail** 6-8, 3-2 C.P. **Stop** 21 C.P.
Single Contact **Side Lights** 6-8, 3 C. P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 12-14 Amps. **Speed** 2800-3000 R.P.M.
Regulation 3rd Brush, Thermo. **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .017″-.022″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order—1-6-2-5-8-3-7-4
Timing Low Comp. 661-D 10° B.T.D.C. 661-S At-T.D.C.
High Comp. 661-D 7° B.T.D.C. 661-S 4° A.T.D.C.

Engine **Bore** 3-1/4″ **Stroke** 4-1/4″ **Taxable H.P.** 33.80
Piston Ring—Width 1-1/8, 1-5/32″, 2-9/64″ **Diam.** 3-1/4″ **Gap All Rings** .007″

Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 46° A.B.C.
Intake Clearance .005″ Hot
Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.
Exhaust Clearance .007″ Hot

Carburetor Ball & Ball Down Draft

Cooling System Centrifugal **Type** Pump **Capacity** 4-1/2 Gals.

Clutch Borg & Beck **Facing**—Moulded 9-7/8″ x 6-3/4″ x 1/8″

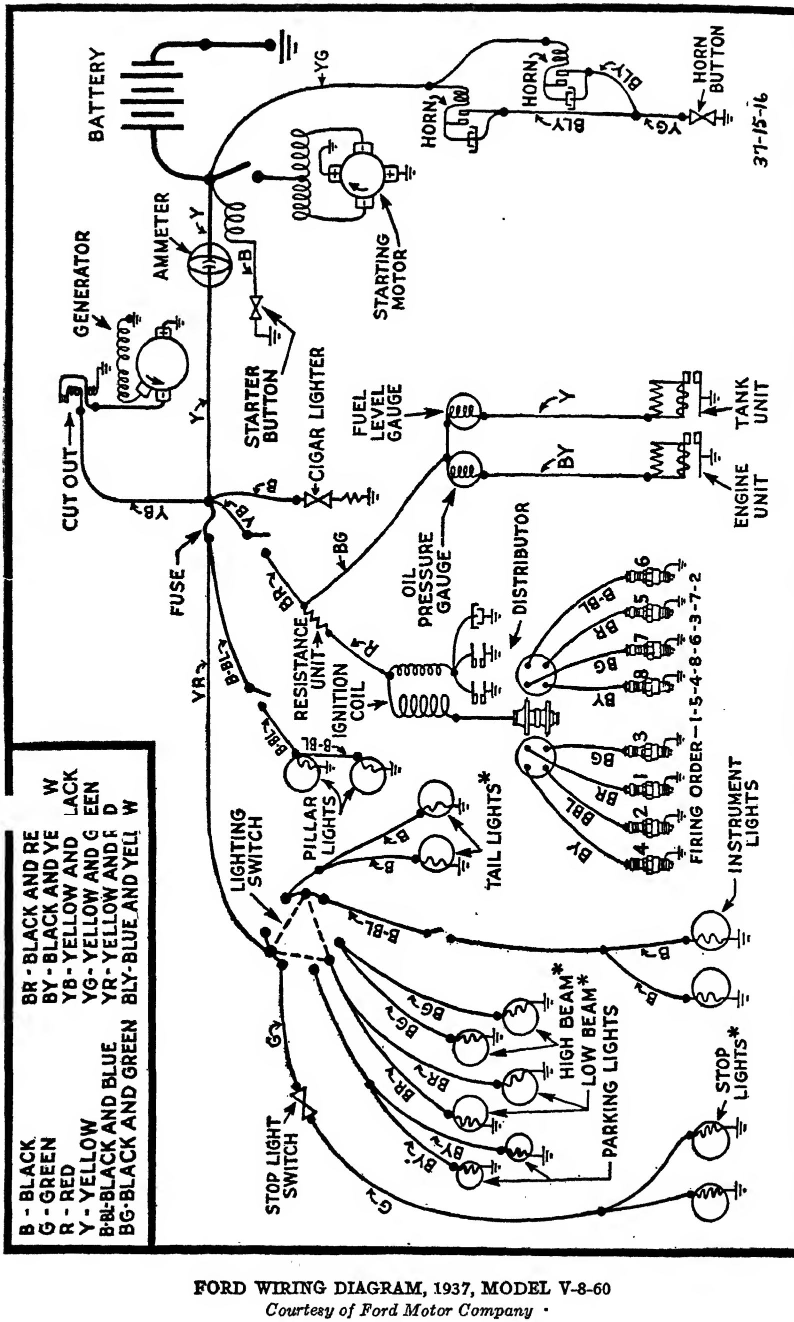
Gear Ratio Ring Gear 43 Pinion 10 Spiral Gears

Axle Own Semi-Floating

				Heel	Toe
Brakes Lockheed Hydraulic	**Front**	23-9/16″ x 2″ x 3/16″	Clearance	.006″	.012″
	Rear	23-9/16″ x 2″ x 3/16″	Clearance	.006″	.012″

Hand Trans. 21-13/32″ x 2″ x 5/16″ Clearance 1/16″

Lining—Moulded



FORD WIRING DIAGRAM, 1937, MODEL V-8-60

Courtesy of Ford Motor Company ·

Ford   Model V-8-60   Year 1937

Battery Ford **Type** **Volts** 6-8 **Amps.** 100
Frame Connection Positive

Lighting **Head Lights** 6-8, 32-32 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator

Generator **Max. Chg. Rate** 15 Amps. Hot **Speed** 2900 R.P.M.
Regulation Third Brush **Cut-in** 7 Volts, 10 M.P.H.
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .014″ to .016″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-4-8-6-3-7-2
Timing 4° B.T.C.

Engine **Bore** 2.6″ **Stroke** 3.2″ **Taxable H.P.** 21.6
Piston Ring—Width Oil 1—.1545″ Comp. 2—.092″
Diam. 2.6″ **Gap** Oil .005″ Comp. .005″
Oiling—Type Gear Pump **Capacity** 4 Qts.
Pressure 30 Lbs. @ 3200 R.P.M.

Valves **Intake Timing—Open** 9° 30′ B.T.C. **Close** 54° 30′ A.B.C.
Intake Clearance Clearance Setting .0125″
Exhaust Timing—Open 57° 30′ B.B.C. **Close** 6° 30′ A.T.C.
Exhaust Clearance Clearance Setting .0125″

Carburetor Dual Down Draft

Steering Caster 6° Camber 1° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump **Capacity** 3.8 Gals.

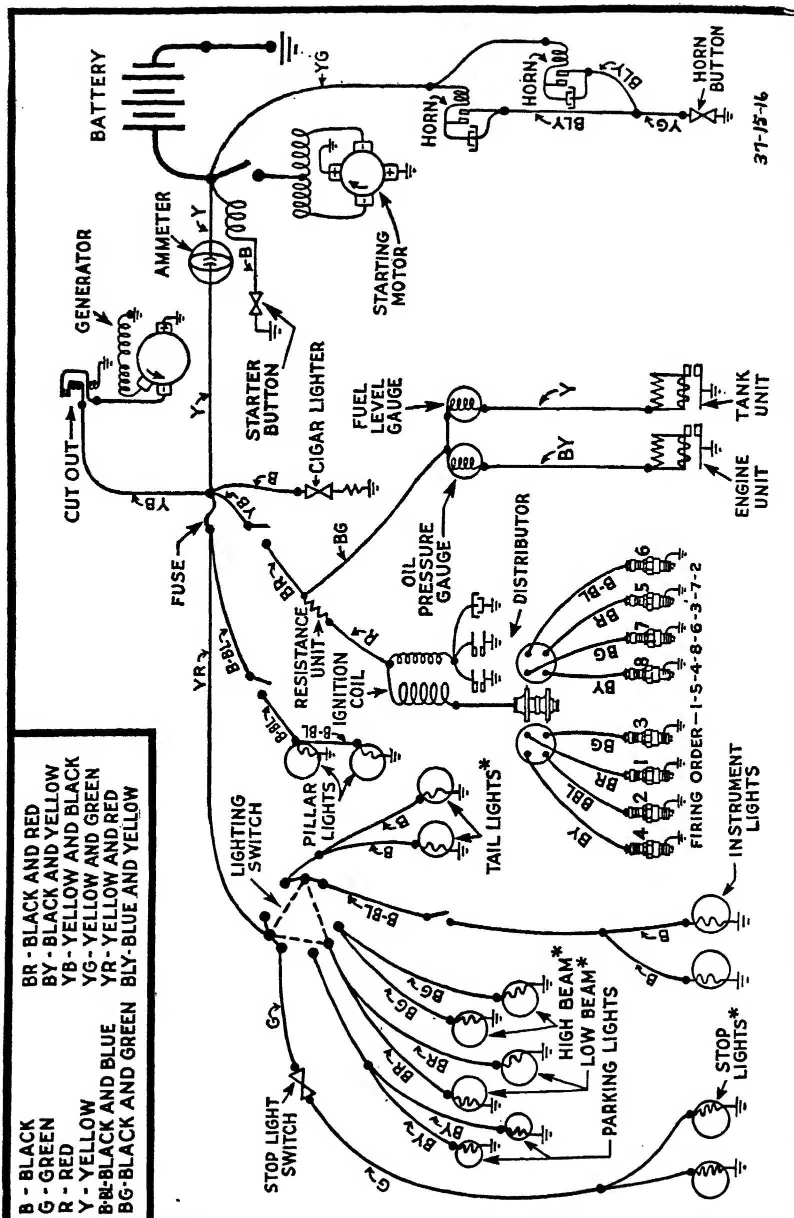
Clutch Plate **Facings** Asbestos Composition 8.5″ x .125″ 2 Required

Gear Ratio 4.44 to 1 Spiral Gears

Axle Own ¾-Floating

Brakes Own Mechanical
Front 13.25″ x 1.75″ x .185″
Rear 13.25″ x 1.75″ x .185″
Hand All Four Wheels
Lining Primary Brass Wire, Secondary Zinc Wire

Diagram 37-15



FORD WIRING DIAGRAM, 1937, MODEL V-8-85

Courtesy of Ford Motor Company

Ford **Model V-8-85** **Year 1937**

Battery Ford **Type** **Volts** 6-8 **Amps.** 100
Frame Connection Positive

Lighting
Head Lights 6-8, 32-32 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 1.5 C.P.

Starter and Generator

Generator **Max. Chg. Rate** 15 Amps. Hot **Speed** 2900 R.P.M.
Regulation Third Brush **Cut-in** 7 Volts, 10 M.P.H.
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .014″ to .016″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order 1-5-4-8-6-3-7-2
Timing 4° B.T.C.

Engine **Bore** 3.062″ **Stroke** 3.75″ **Taxable H.P.** 30
Piston Ring—Width Oil 1—.1545″ Comp. 2—.0915″
Diam. 3.062″ **Gap** Oil .005″ Comp. .009″
Oiling—Type Gear Pump **Capacity** 5 Qts.
Pressure 30 Lbs. @ 2600 R.P.M.

Valves **Intake Timing—Open** 9° 30′ B.T.C. **Close** 54° 30′ A.B.C.
Intake Clearance Clearance Setting .0125″ to .0135″
Exhaust Timing—Open 57° 30′ B.B.C. **Close** 6° 30′ A.T.C.
Exhaust Clearance Clearance Setting .0125″ to .0135″

Carburetor Dual Down Draft

Steering Caster 6° Camber 1° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump **Capacity** 5.5 Gals.

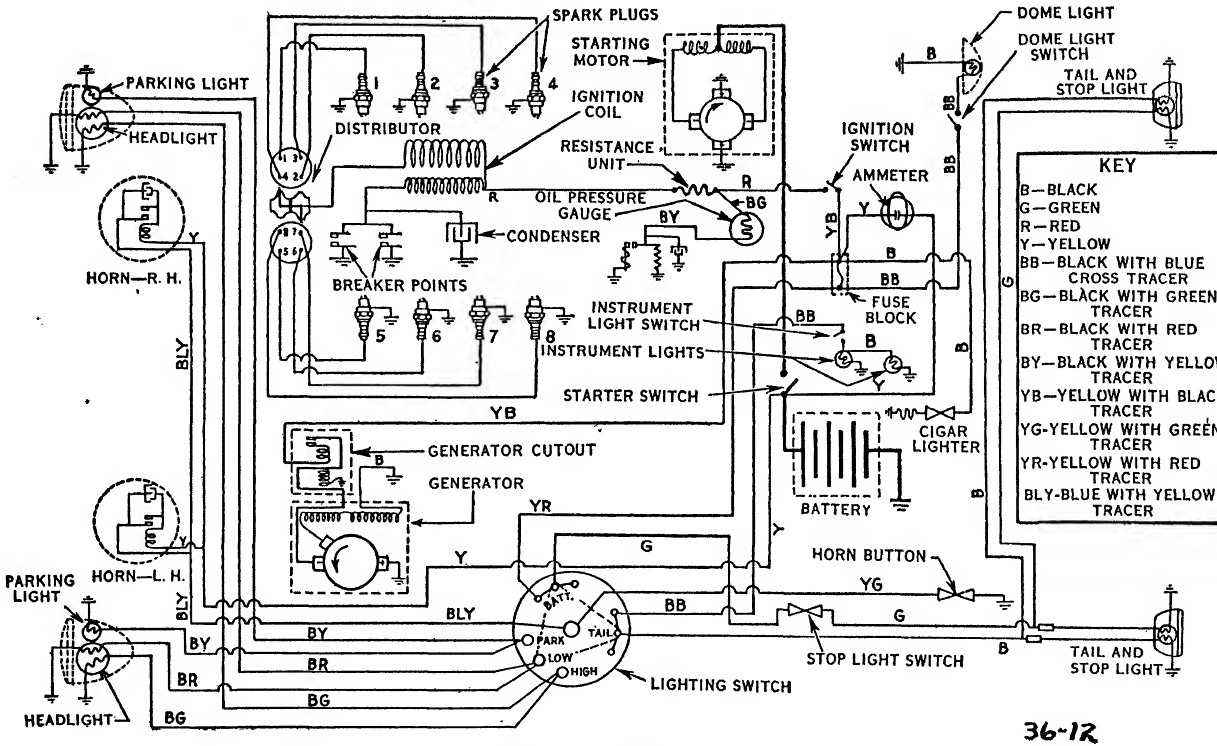
Clutch Plate **Facings** Asbestos Composition 9″ x .140″ 2 Required

Gear Ratio 3.78 to 1 Spiral Gears

Axle Own ¾-Floating

Brakes
Own
Mechanical
Front 13.25″ x 1.75″ x .185″
Rear 13.25″ x 1.75″ x .185″
Hand All Four Wheels
Lining Primary Brass Wire, Secondary Zinc Wire

Diagram 37-16



FORD WIRING DIAGRAM, 1936, MODEL V-8

Courtesy of Ford Motor Company

Ford **Model V-8** **Year 1936**

Battery	Ford	**Type**	**Volts** 6	**Amps.** !
		Frame Connection Positive		

Lighting	Mazda 2330	**Head Lights**	6-8, 32-32 C.P.	
		Stop Light	6-8, 21 C.P.	**Tail** 6-8, 2 C.P.
		Parking Lights	6-8, 3 C.P.	

Starter and Generator Auto-Lite

Generator Auto-Lite	**Max. Chg. Rate** 14 Amps.	Hot	**Speed** 25 M.P.H.
	Regulation 3rd Brush		**Cut-in**
	Relay Air Gap .010″-.015″		**Contact Gap** .015″-.020″

Ignition Auto-Lite	**Contact Breaker Gap** .015″	
	Spark Plug—Size 18 M.M.	**Gap** .025″
	Firing Order 1-5-4-8-6-3-7-2	
	Timing 4° B.T.C.	

Engine **Bore** 3$\frac{1}{16}$″ **Stroke** 3$\frac{3}{4}$″ **Taxable H.P.** 30

Piston Ring—Width Oil 1—$\frac{5}{32}$″ Comp. 2—$\frac{3}{32}$″

Diam. 3$\frac{1}{16}$″ **Gap** Oil .005″ Comp. .009″

Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 9$\frac{1}{2}$° B.T.C. **Close** 54$\frac{1}{2}$° A.B.C.

Intake Clearance .013″

Exhaust Timing—Open 57$\frac{1}{2}$° B.B.C. **Close** 6$\frac{1}{2}$° A.T.C.

Exhaust Clearance .013″

Carburetor Stromberg EE1

Steering Caster 7° Camber 2° Toe-in $\frac{1}{16}$″

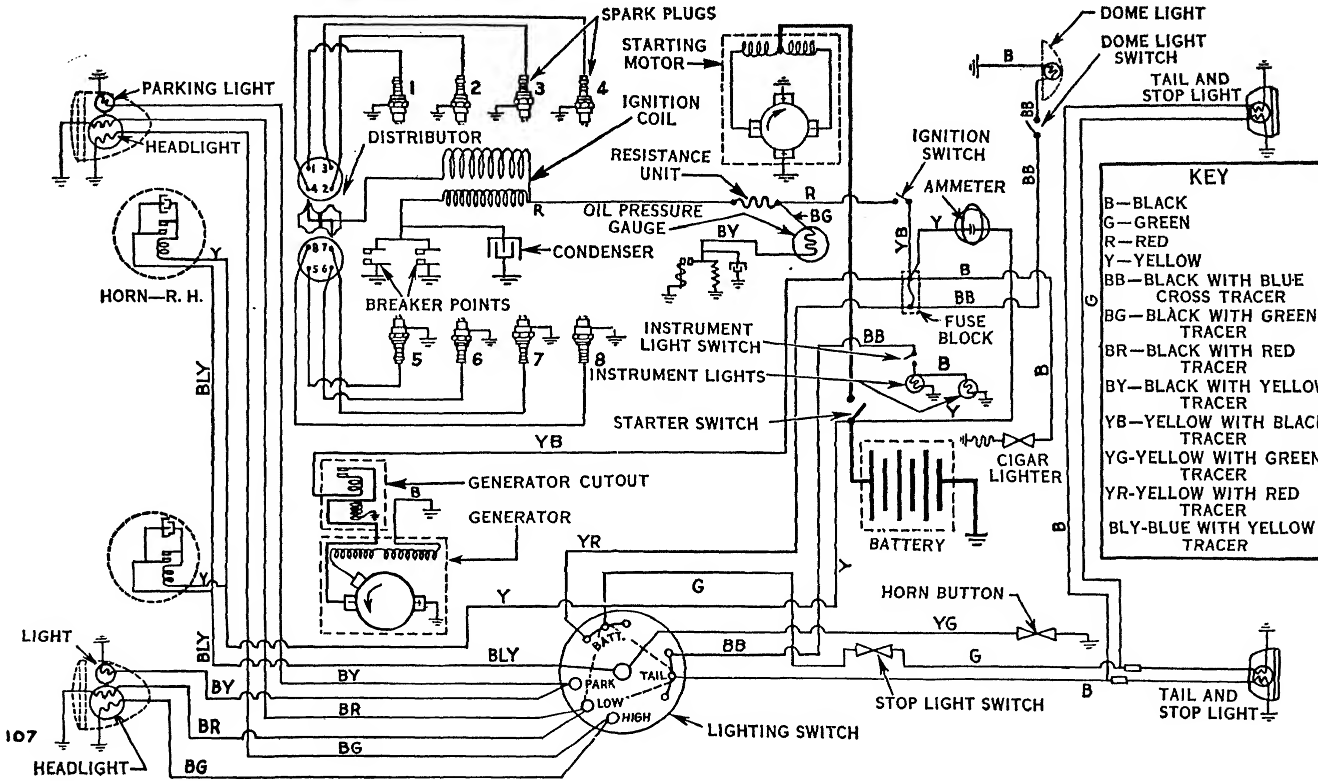
Cooling System Centrifugal **Type** Pump **Capacity** 20 Qts.

Clutch Long **Facings** Moulded 5$\frac{3}{4}$″ x 9″ x .137″ 2 Required

Gear Ratio 4.1 to 1 Spiral Gears

Axle $\frac{3}{4}$-Floating

Brakes Mechanical	**Front** 26$\frac{1}{2}$″ x 1$\frac{3}{4}$″ x $\frac{11}{64}$″	**Clearance** .010″
	Rear 26$\frac{1}{2}$″ x 1$\frac{3}{4}$″ x $\frac{11}{64}$″	**Clearance** .010″
	Hand 4 Wheels	
	Lining Semi-Moulded	Diagram 36-12



FORD WIRING DIAGRAM, 1935, MODEL V-8

Courtesy of Ford Motor Company

Ford **Model V-8** **Year 1935**

Battery Ford **Type** **Volts 6** **Amps.**
Frame Connection Positive

Lighting **Head Lights** 6-8, 32-32 C.P.
Dash and Tail
Side Lights

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 10 Amps. **Speed** 1600 R.P.M. Armature
Regulation 3rd Brush **Cut-in** 7 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .012″-.014″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order 1-5-4-8-6-3-7-2
Timing 4° B.T.C.

Engine **Bore** 3$\frac{1}{16}$″ **Stroke** 3$\frac{3}{4}$″ **Taxable H.P. 30**
Piston Ring—Width Oil 1—$\frac{5}{32}$″ Comp. 2—$\frac{3}{32}$″
Diam. 3$\frac{1}{16}$″ **Gap** Oil .006″ Comp. .009″
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 9° 30′ B.T.C. **Close** 54° 30′ A.B.C.
Intake Clearance .0125″
Exhaust Timing—Open 57° 30′ B.B.C. **Close** 6° 30′ A.T.C.
Exhaust Clearance .0125″

Carburetor Stromberg

Steering Caster 7° Camber 2° Toe-in $\frac{1}{16}$″

Cooling System Thermo-Syphon and Pump **Capacity** 20 Qts.

Clutch Long **Facings** Moulded 9″ x 5.76″ x .140″ 2 Required

Gear Ratio 4.11 to 1

Axle Own $\frac{3}{4}$-Floating

Brakes Mechanical
Front 26$\frac{1}{2}$″ x 1$\frac{3}{4}$″ x .185″
Rear 26$\frac{1}{2}$″ x 1$\frac{3}{4}$″ x .185″
Hand 4 Service
Lining Semi-Moulded

Diagram 107

Ford **Model V-8-112** **Year 1934**

Battery	Ford	**Type** 40-17	**Volts** 6	**Amps.** 96
		Frame Connection	Positive	

Lighting	Mazda 1000	**Head Lights**	6-8, 32-32 C.P.
	Mazda 63, 1158	**Dash, Tail and Stop**	6-8, 3-2-21 C.P.
	Mazda 63	**Side Lights**	6-8, 3 C.P.

Starter and Generator

Generator Hot **Max. Chg. Rate** 18 Amps. **Speed** 1875 R.P.M.
Regulation 3rd Brush **Cut-in** 7 Volts
Relay Air Gap .010″-.015″ **Contact Gap** .015″-.020″

Ignition **Contact Breaker Gap** .012″-.014″
Spark Plug—Size 18 MM. **Gap** .025
Firing Order 1-5-4-8-6-3-7-2 See Diagram
Timing 4° B.T.C.

Engine **Bore** $3\frac{1}{16}$″ **Stroke** $3\frac{3}{4}$″ **Taxable H.P.** 30.0
Piston Ring—Width Oil 1—$\frac{5}{32}$″ Comp. 2—$\frac{3}{16}$″
Diam. $3\frac{1}{16}$″ **Gap** Oil .005″ Comp. .010″
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** $9\frac{1}{2}$° B.T.C. **Close** $54\frac{1}{2}$° A.B.C.
Intake Clearance .013″
Exhaust Timing—Open $57\frac{1}{2}$° A.B.C. **Close** $6\frac{1}{2}$° A.T.C.
Exhaust Clearance .020″

Carburetor Detroit

Steering Caster $8\frac{3}{4}$° Camber 2° Toe-in $\frac{1}{32}$″

Cooling System Centrifugal **Type** Pump **Capacity** $5\frac{1}{2}$ Gals.

Clutch Long **Facings** Moulded $5\frac{3}{4}$″ x 9″ x .137″ 2 Required

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own $\frac{3}{4}$ Floating

Brakes Own Mechanical
Front $31\frac{1}{2}$″ x $1\frac{1}{2}$″ x $\frac{3}{16}$″ Clearance .010″
Rear $31\frac{1}{2}$″ x $1\frac{1}{2}$″ x $\frac{3}{16}$″ Clearance .010″
Hand Rear Service
Lining Semi-Moulded

Ford **Model V-8-112** **Year 1933**

Battery	Ford	**Type** Ford	**Volts** 6	**Amps.** 80
		Frame Connection	Positive	

Lighting	Double Contact	**Head Lights**	6-8, 21-21 C.P.	
	Single Contact	**Dash & Tail**	6-8, 3 C.P.	**Stop** 21 C.P.
	Single Contact	**Side Lights**	6-8, 3 C.P.	

Starter and Generator Ford **Ignition** Ford-Mallory

Generator
- **Max. Chg. Rate** 10.7 Amps. **Speed** 1600 R.P.M.
- **Regulation** 3rd Brush **Cut-in** 8.5 M.P.H.
- **Relay Air Gap** .010″-.015″ **Contact Gap** .015″-.020″

Ignition
- **Contact Breaker Gap** .012″-.014″ (on both sets)
- **Spark Plug—Size** 18 M.M. **Gap** .025″
- **Firing Order**—1-5-4-8-6-3-7-2
- **Timing** 4° B.T.D.C.

Engine **Bore** 3-1/16″ **Stroke** 3-3/4″ **Taxable H.P.** 30

Piston Ring—Width 1-5/32″, 2-3/32″ **Diam.** 3-1/16″ **Gap** Oil .005″
Comp. .010″

Oiling—Type Pump **Capacity** 5 Qts.

Valves
- **Intake Timing—Open** 9-1/2° B.T.C. **Close** 54-1/2° A.B.C.
- **Intake Clearance** .013″
- **Exhaust Timing—Open** 57-1/2° B.B.C. **Close** 6-1/2° A.T.C.
- **Exhaust Clearance** .020″

Carburetor Detroit Lubricator Company

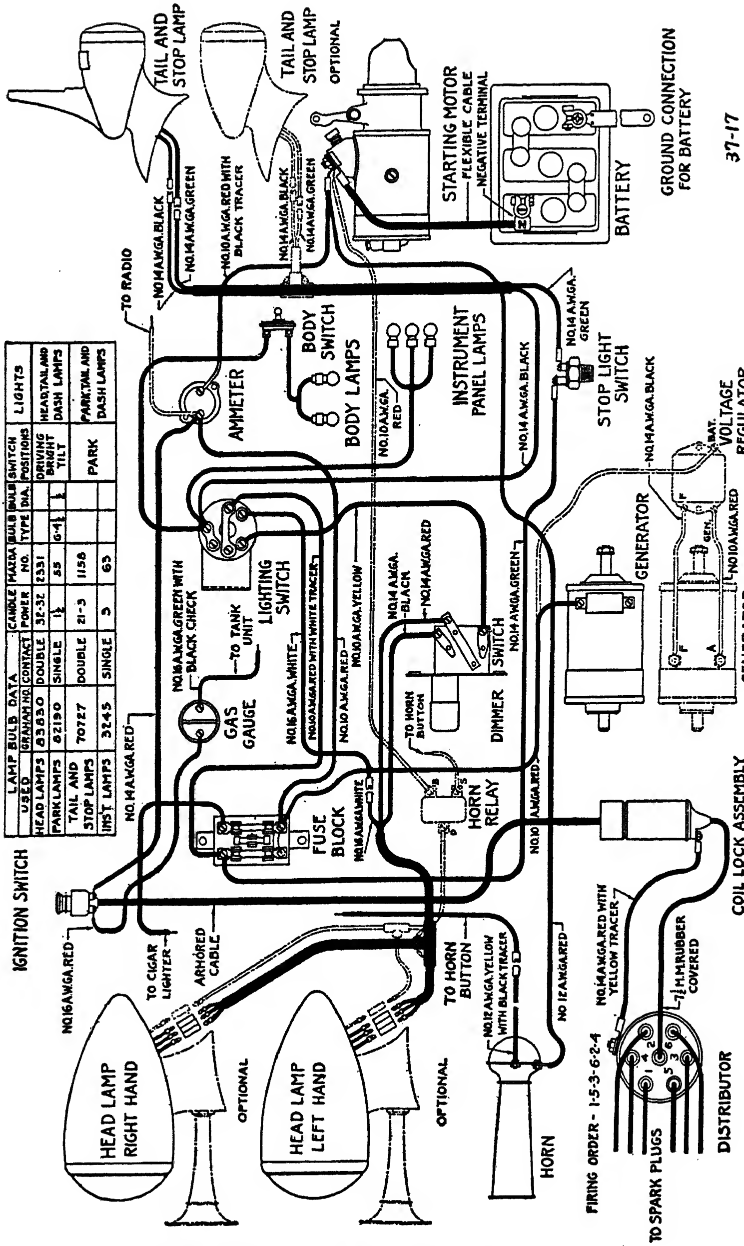
Cooling System Centrifugal **Type** Pump **Capacity** 5-1/2 Gals.

Clutch Long **Facing**—Moulded 9″ x 5-3/4″ x .137″

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own 3/4 Floating

Brakes
Own
Mechanical
- **Front** 31″ x 1-1/2″ x 3/16″ **Clearance** .010″
- **Rear** 31″ x 1-1/2″ x 3/16″
- **Hand** Rear Wheels
- **Lining**—Semi-Moulded



LAMP USED	BULB DATA GRAHAM NO.	CONTACT	CANDLE POWER	MAZDA NO.	BULB TYPE	BULB DIA.	SWITCH POSITIONS	LIGHTS
HEAD LAMPS	83830	DOUBLE	32-32	2331			DRIVING BRIGHT TILT	HEAD, TAIL AND DASH LAMPS
PARK LAMPS	82190	SINGLE	1½	55	G-4½	½		
TAIL AND STOP LAMPS	70727	DOUBLE	21-3	1158			PARK	PARK, TAIL AND DASH LAMPS
INST. LAMPS	3245	SINGLE	3	63				

GRAHAM WIRING DIAGRAM, 1937, MODEL CAVALIER 85
Courtesy of Graham-Paige Motors Corporation

Graham **Model Cavalier 85** **Year 1937**

Battery Willard **Type** **Volts** 6-8 **Amps.** 90
Frame Connection Positive

Lighting **Head Lights** 6-8 Volts
Stop Light 6-8 Volts **Tail** 6-8 Volts
Parking Lights 6-8 Volts

Starter and Generator Delco-Remy

Generator Delco-Remy — **Max. Chg. Rate** 15 Amps. Hot **Speed** 2400 R.P.M., Arm.
Regulation **Cut-in** 6-8 Volts
Relay Air Gap **Contact Gap**

Ignition Delco-Remy — **Contact Breaker Gap** .018″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 2° B.T.C.

Engine **Bore** 3¼″ **Stroke** 4″ **Taxable H.P.** 25.35
Piston Ring—Width Oil, Upper 3/16″ Lower 5/32″ Comp. 2—3/32″
Diam. 3¼″ Gap Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 5 Qts.
Pressure 40 Lbs. @ 30 M.P.H.

Valves **Intake Timing—Open** 4½° B.T.C. **Close** 47½° A.B.C.
Intake Clearance Hot .010″ Operating, .012″ Timing
Exhaust Timing—Open 47½° B.B.C. **Close** 4½° A.T.C.
Exhaust Clearance Hot .010″ Operating, .012″ Timing

Carburetor Marvel B2SU

Steering Caster 4½° Camber 1° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 11 Qts.

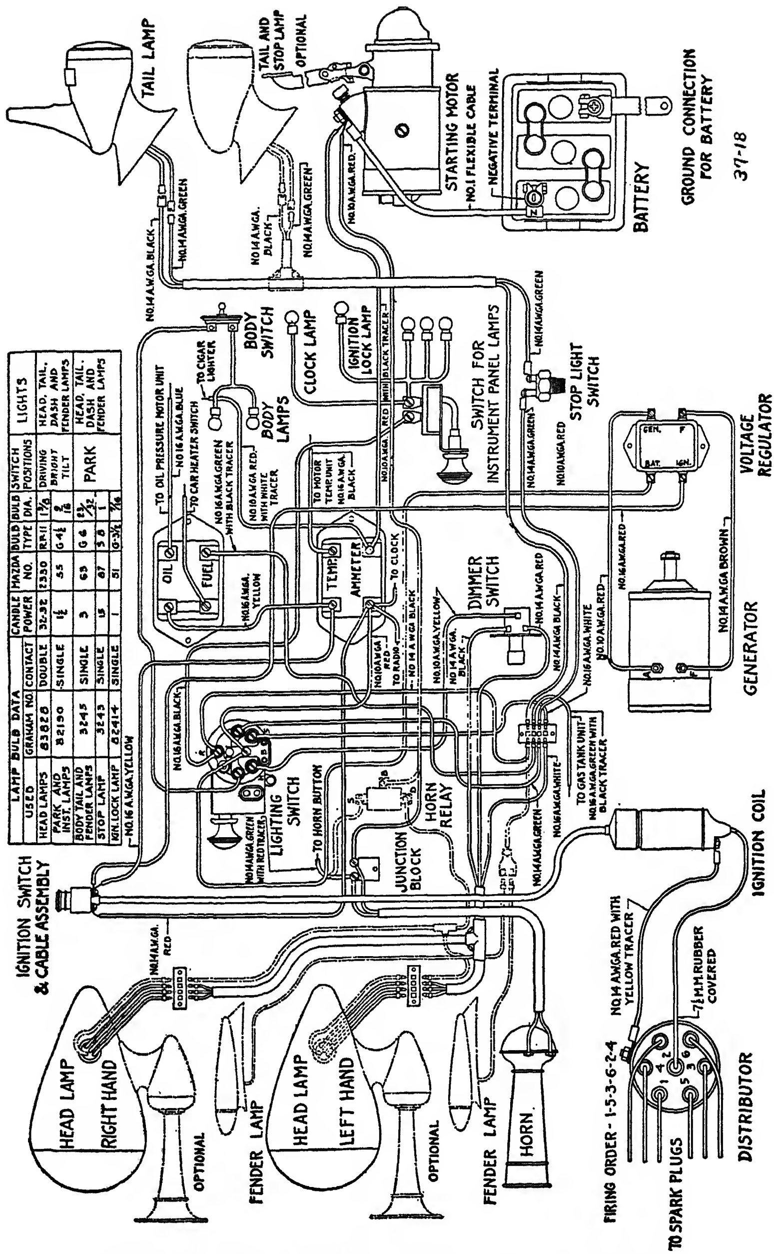
Clutch Illinois **Facings** Moulded 5⅛″ x 7⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 50 Pinion 11 Spiral Gears

Axle Spicer Semi-Floating

Brakes Lockheed Hydraulic — **Front** 18″ x 1¾″ x 3/16″
Rear 18″ x 1¾″ x 3/16″
Hand Rear Service
Lining Moulded

Diagram 37-17



GRAHAM WIRING DIAGRAM, 1937, MODEL 116 SUPERCHARGED

Courtesy of Graham-Paige Motors Corporation

Graham Model 116 Supercharged Year 1937

Battery Willard **Type** **Volts** 6-8 **Amps.** 105
Frame Connection Positive

Lighting **Head Lights** 6-8 Volts
Stop Light 6-8 Volts **Tail** 6-8 Volts
Parking Lights 6-8 Volts

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 22 Amps. Hot **Speed** 2900 R.P.M., Arm.
Regulation Current Control **Cut-in** 7 Volts, 800 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .018″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 4° B.T.C.

Engine **Bore** 3¼″ **Stroke** 4″ **Taxable H.P.** 25.35
Piston Ring—Width Oil, Upper 3/16″ Lower 5/32″ Comp. 2—3/32″
Diam. 3¼″ **Gap** Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 5 Qts.
Pressure 40 Lbs. @ 30 M.P.H.

Valves **Intake Timing—Open** 4½° B.T.C. **Close** 47½° A.B.C.
Intake Clearance Hot .010″ Operating, .012″ Timing
Exhaust Timing—Open 47½° B.B.C. **Close** 4½° A.T.C.
Exhaust Clearance Hot .010″ Operating, .012″ Timing

Carburetor Marvel B3

Steering Caster 3° Camber 1° Toe-in ⅛″

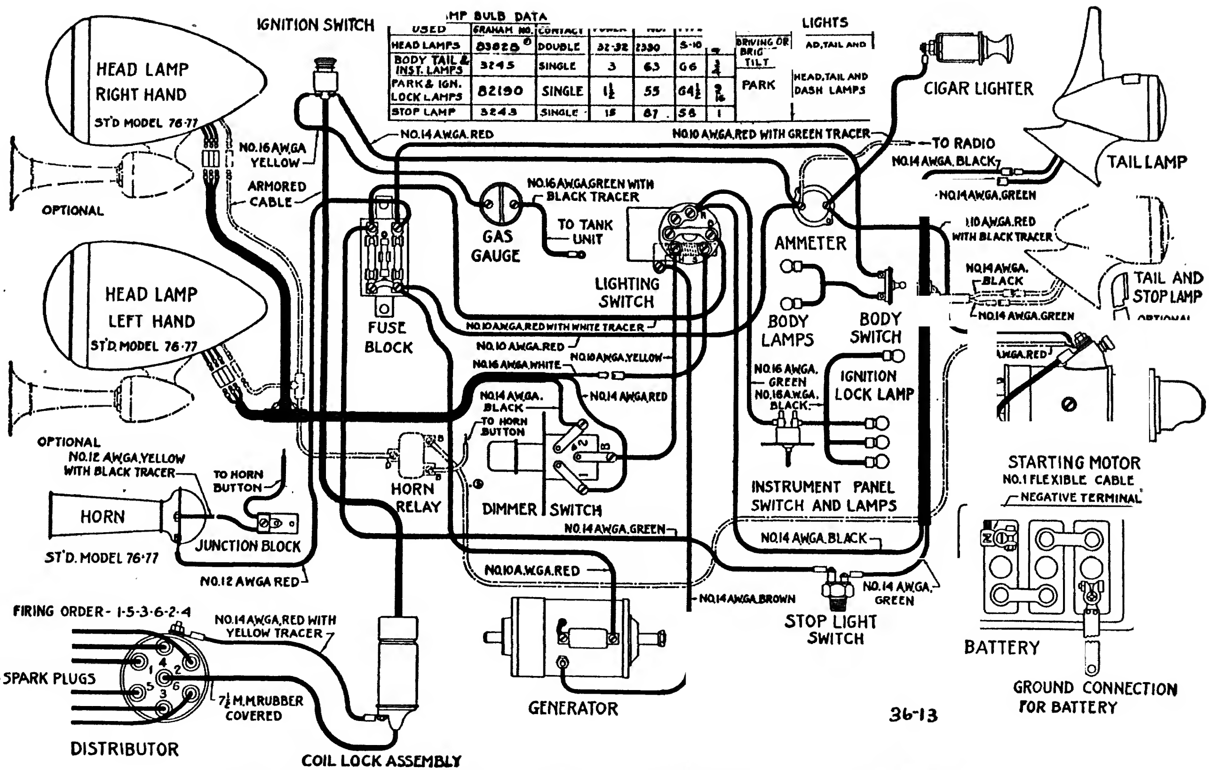
Cooling System Centrifugal **Type** Pump, Belt **Capacity** 15 Qts.

Clutch Long **Facings** Woven 5¾″ x 9″ x ⅛″ 2 Required

Gear Ratio Ring Gear 47 Pinion 11 Spiral Gears

Axle Spicer Semi-Floating

Brakes Lockheed Hydraulic
Front 18″ x 1¾″ x ¼″
Rear 18″ x 1¾″ x ¼″
Hand Transmission 17¾″ x 2″ x 5/32″ Clearance 1/32″
Lining Moulded Diagram 37-18



GRAHAM CAVALIER WIRING DIAGRAM, 1936, SERIES 90 AND 110 SUPERCHARGED
Courtesy of Graham-Paige Motors Corporation

Graham Cavalier Models Series 90 and 110 Supercharged Year 1936

Battery Willard **Type** **Volts** 6 **Amps.** 100
Frame Connection Positive

Lighting Mazda 2330 **Head Lights** 6-8, 32-32 C.P.
Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 1½ C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy **Max. Chg. Rate** 14-21 Amps. **Speed** 2400 R.P.M.
Regulation **Cut-in** 7 Volts
Relay Air Gap **Contact Gap**

Ignition Delco-Remy **Contact Breaker Gap** .018″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing T.D.C. Full Advance

Engine **Bore** 3¼″ **Stroke** 4⅜″ **Taxable H.P.** 25.35
Piston Ring—Width Oil 1—³⁄₁₆″ Comp. 2—⅛″
Diam. 3¼″ **Gap** .007″
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 4½° B.T.C. **Close** 47½° A.B.C.
Intake Clearance .010″ Hot
Exhaust Timing—Open 47½° B.B.C. **Close** 4½° A.T.C.
Exhaust Clearance .010″ Hot

Carburetor Marvel B

Steering Caster 2½° Camber 1° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 15 Qts.

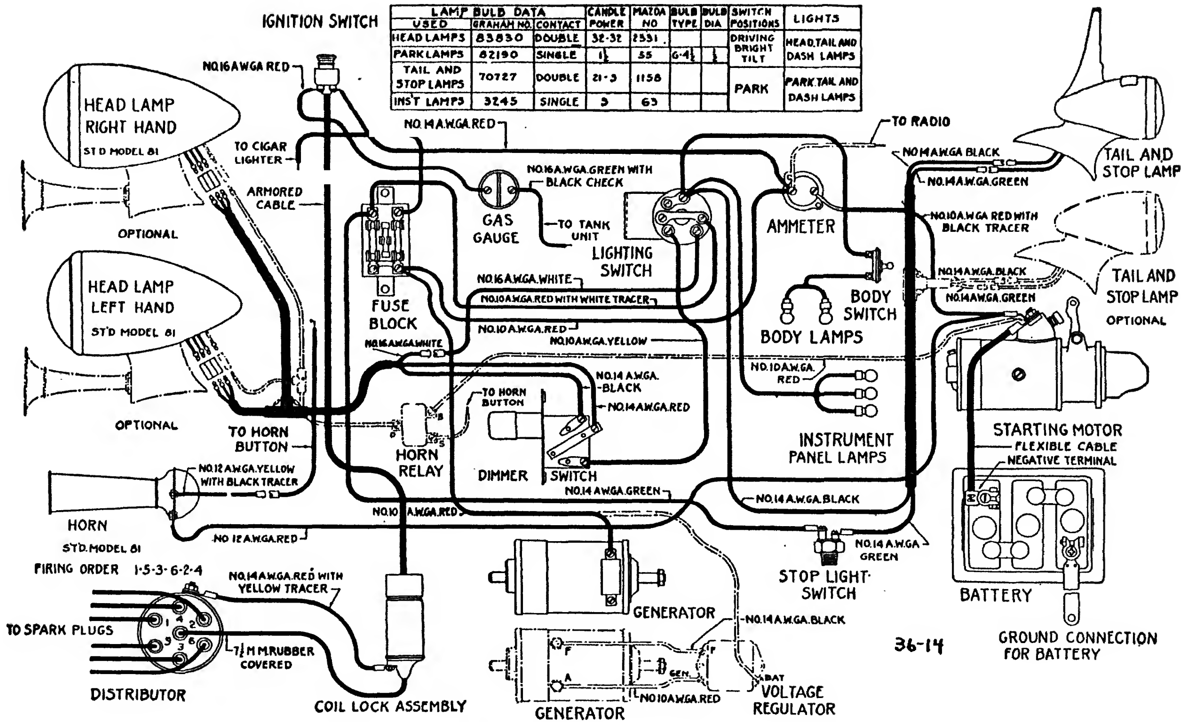
Clutch Illinois **Facings** Woven 5⅝″ x 9″ x ⅛″ 2 Required

Gear Ratio 4.2 to 1

Axle Semi-Floating

Brakes Lockheed Hydraulic
- **Front** 23″ x 1¾″ x .255″ Clearance Heel .006″ Toe .010″
- **Rear** 23″ x 1¾″ x .255″ Clearance Heel .006″ Toe .010″
- **Hand** Trans. 17¾″ x 2″ x ⁵⁄₃₂″ Clearance ¹⁄₃₂″

Lining Moulded **Diagram** 36-13



LAMP BULB DATA USED	GRAHAM NO.	CONTACT	CANDLE POWER	MAZDA NO	BULB TYPE	BULB DIA	SWITCH POSITIONS	LIGHTS
HEAD LAMPS	83830	DOUBLE	32-32	2331			DRIVING BRIGHT TILT	HEAD, TAIL AND DASH LAMPS
PARK LAMPS	82190	SINGLE	1½	55	G-4½	½		
TAIL AND STOP LAMPS	70727	DOUBLE	21-3	1158			PARK	PARK, TAIL AND DASH LAMPS
INST LAMPS	3245	SINGLE	3	63				

GRAHAM CRUSADER WIRING DIAGRAM, 1936, SERIES 80

Courtesy of Graham-Paige Motors Corporation

Graham Crusader **Model Series 80** **Year 1936**

Battery Willard **Type** **Volts** 6 **Amps.** 86
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6, 1½ C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 15 Amps. **Speed** 2400 R.P.M.
Regulation **Cut-in** 6-8 Volts
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .018″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 2° B.T.C. Full Advance

Engine **Bore** 3″ **Stroke** 4″ **Taxable H.P.** 21.6
Piston Ring—Width Oil 1—3/16″ **Comp.** 2—⅛″
Diam. 3″ **Gap** .007″
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 2° B.T.C. **Close** 42° A.B.C.
Intake Clearance .010″
Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.
Exhaust Clearance .010″

Carburetor Marvel B2SU

Steering Caster 2½° Camber 1° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 12 Qts.

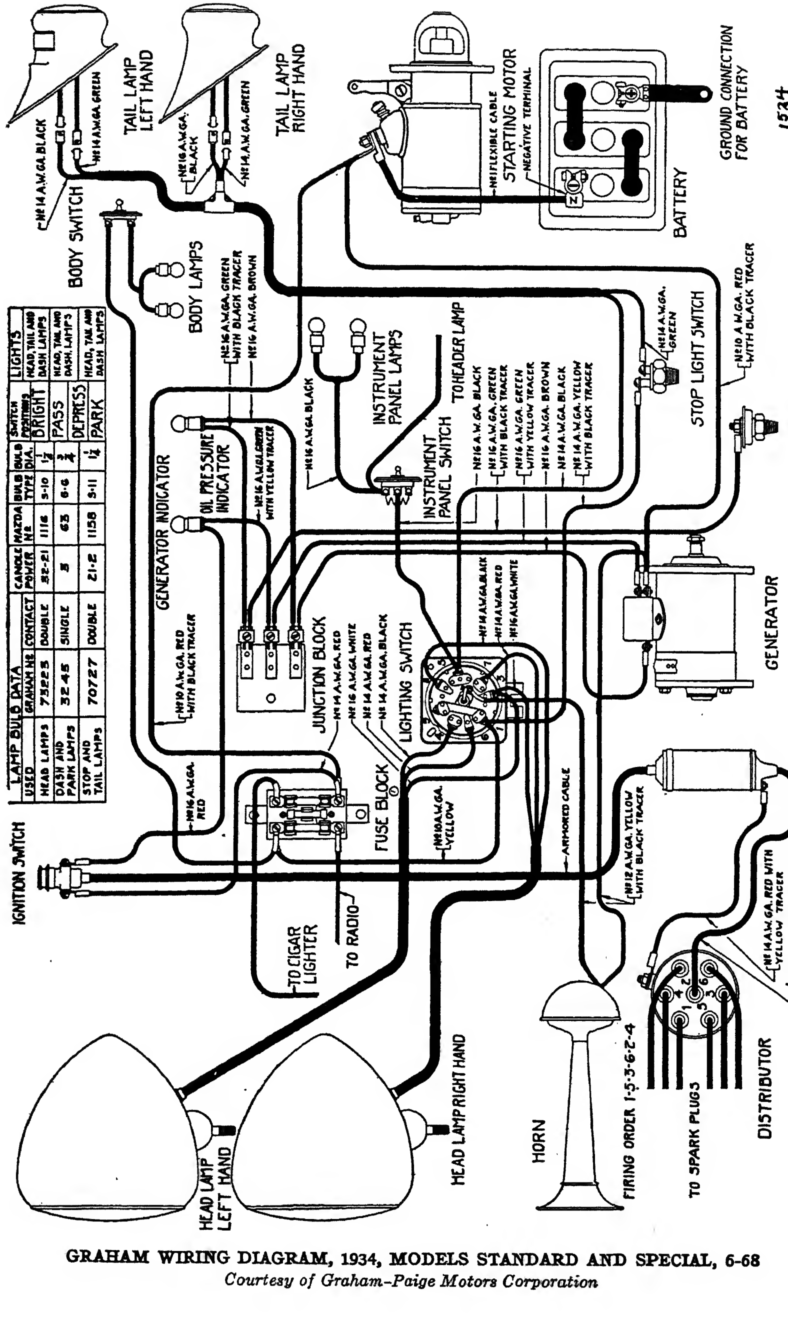
Clutch Illinois **Facings** Moulded 5⅛″ x 8⅞″ x ⅛″ 2 Required

Gear Ratio 4.53 to 1 Spiral Gears

Axle Semi-Floating

Brakes Own Hydraulic
Front 18″ x 1¾″ x .200″ Clearance .008″
Rear 18″ x 1¾″ x .200″ Clearance .008″
Hand Rear Service

Lining Moulded Diagram 36-14



LAMP BULB DATA						
USED	GRAHAM No	CONTACT	CANDLE POWER	MAZDA No	BULB TYPE	BULB DIA.
HEAD LAMPS	73225	DOUBLE	32-21	1116	S-10	1½
DASH AND PARK LAMPS	3245	SINGLE	3	63	G-6	¾
STOP AND TAIL LAMPS	70727	DOUBLE	21-2	1158	S-11	1¼

SWITCH POSITIONS	LIGHTS
BRIGHT	HEAD, TAIL AND DASH LAMPS
PASS	HEAD, TAIL AND DASH. LAMPS
DEPRESS	
PARK	HEAD, TAIL AND DASH LAMPS

GRAHAM WIRING DIAGRAM, 1934, MODELS STANDARD AND SPECIAL, 6-68

Courtesy of Graham-Paige Motors Corporation

Graham — Models Standard and Special, 6-68 — Year 1934

Battery Willard **Type** WS-1-13 **Volts** 6 **Amps.** 86
Frame Connection Positive

Lighting
Mazda 3230-C **Head Lights** 6-8, 32-21 C.P.
Mazda 63, 1158 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 13-15 Amps. **Speed** 3000 R.P.M.
Regulation 3rd Brush **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024
Spark Plug—Size ⅞″ S.A.E. **Gap** .023″-.027″
Firing Order 1-5-3-6-2-4
Timing 3° B.T.C.

Engine **Bore** 3¼″ **Stroke** 4½″ **Taxable H.P.** 25.35
Piston Ring—Width Oil 1—³⁄₁₆″ Comp. 2—⅛″
Diam. 3¼″ **Gap** Oil .007″ Comp. .010″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 40° A.B.C.
Intake Clearance .010″ Hot
Exhaust Timing—Open 40° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .010″ Hot

Carburetor Detroit

Steering Caster 1½° Camber 1½° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 5 Gals.

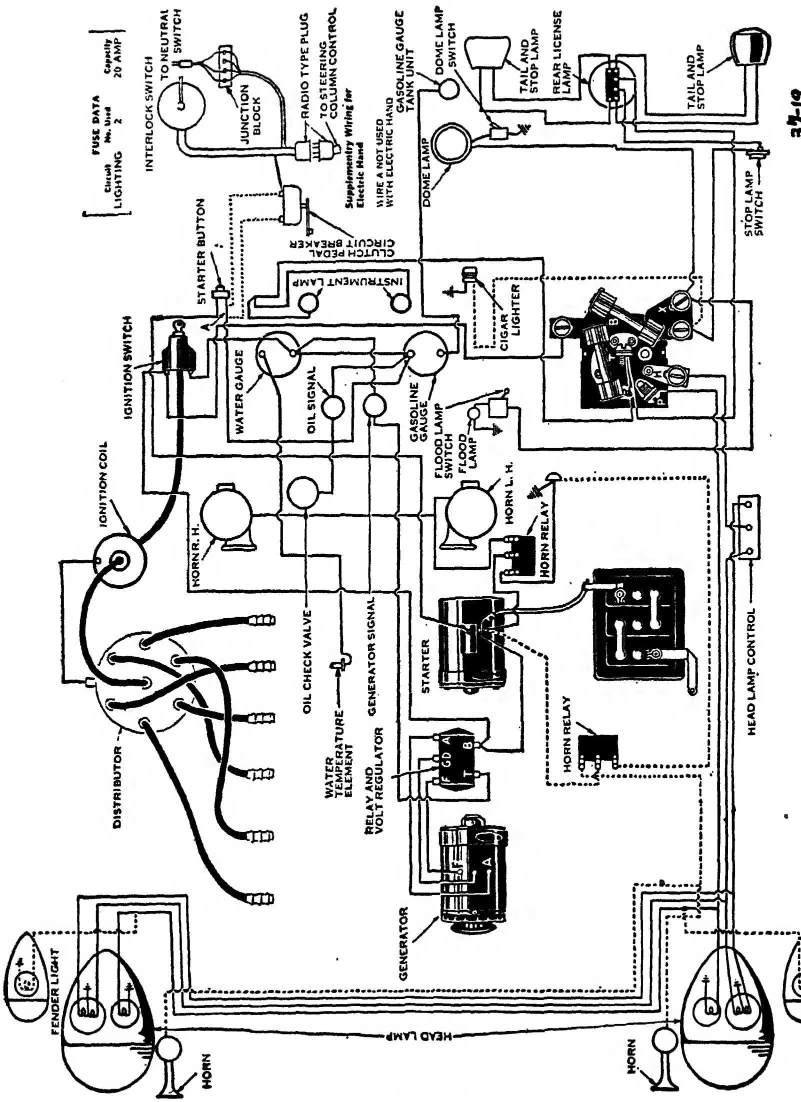
Clutch Long **Facing** Moulded 5½″ x 9¼″ x .137″ 2 Required

Gear Ratio Ring Gear 47 Pinion 11 Spiral Gears

Axle Spicer Semi-Floating

Brakes Lockheed Hydraulic
Front 1¾″ x ³⁄₁₆″ Clearance Heel .006″ Toe .012″
Rear 1¾″ x ³⁄₁₆″ Clearance Heel .006″ Toe .012″
Hand Transmission 18³⁄₁₆″ x 2″ x ⁵⁄₃₂″ Clearance ¹⁄₃₂″
Lining Woven

Diagram 1524



HUDSON WIRING DIAGRAM, 1937, 6-CYLINDER

Courtesy of Hudson Motor Car Company

Hudson **Model 6-Cylinder** **Year 1937**

Battery National **Type** **Volts** 6-8 **Amps.** 105
Frame Connection Positive

Lighting Mazda 2331 D.C. **Head Lights** 6-8, 32-32 C.P.
Mazda 1158 **Stop Light** 6-8 Volts **Tail** 6-8, 3-21 C.P., D.C.
Mazda 55 **Parking Lights** 6-8, 1 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 22 Amps. Hot **Speed** 2600 R.P.M., Arm.
Regulation Voltage and Current **Cut-in** 6.5 Volts, 750 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 14 M.M. **Gap** .022″
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Engine **Bore** 3″ **Stroke** 5″ **Taxable H.P.** 21.60
Piston Ring—Width Oil 2—3/16″ Comp. 2—3/32″
Diam. 3″ **Gap** Oil .009″ Comp. .009″
Oiling—Type Press. **Capacity** 5 Qts. **Pressure** 3 Lbs. Max.

Valves **Intake Timing—Open** 10½° B.T.C. **Close** 60° A.B.C.
Intake Clearance Hot .008″.
Exhaust Timing—Open 50° B.B.C. **Close** 18½° A.T.C.
Exhaust Clearance Hot .010″

Carburetor Carter 344S

Steering Caster 0° Camber 1° Toe-in 0″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 20 Qts.

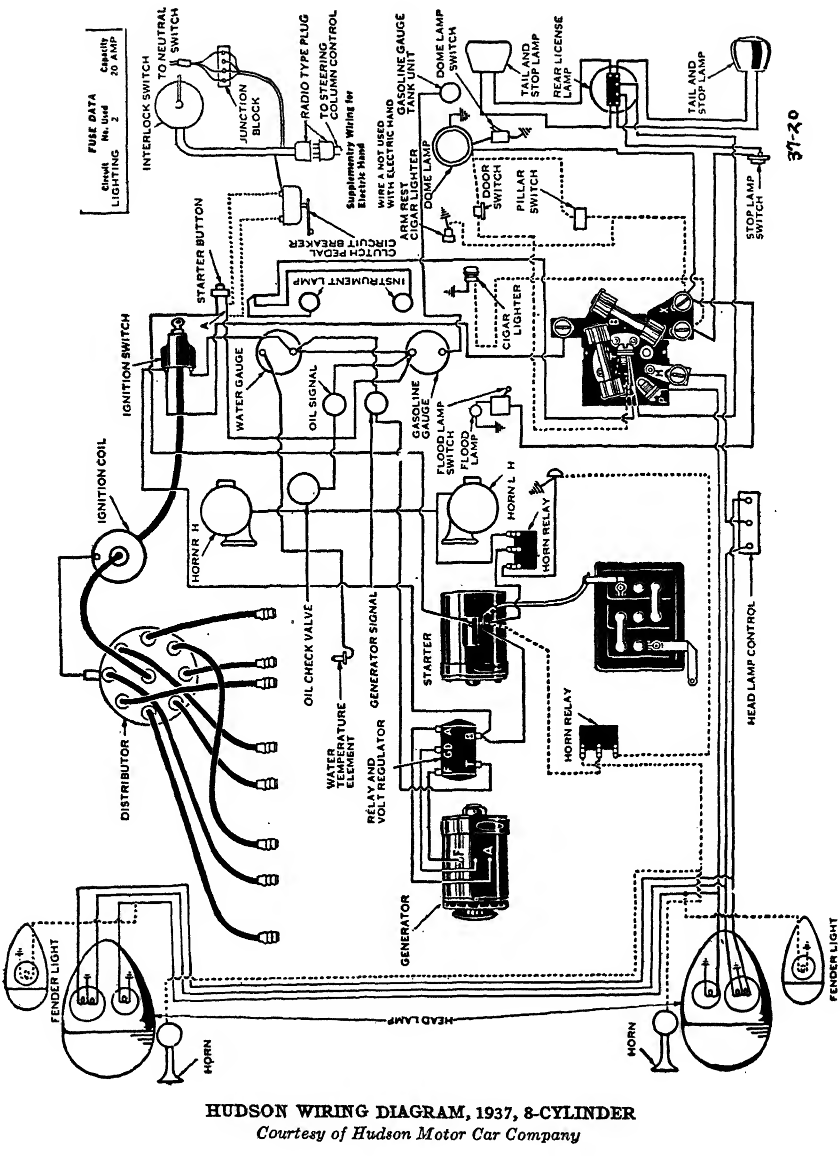
Clutch Own **Facings** Cork 5⅜″ x 8⅝″ x .203″

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 22⅛″ x 1¾″ x 7/32″ Clearance .010″
Rear 22⅛″ x 1¾″ x 7/32″ Clearance .010″
Hand Rear Service

Lining Moulded Diagram 37-19



HUDSON WIRING DIAGRAM, 1937, 8-CYLINDER

Courtesy of Hudson Motor Car Company

Hudson **Model 8-Cylinder** **Year 1937**

Battery National **Type** **Volts** 6-8 **Amps.** 125
Frame Connection Positive

Lighting Mazda 2331 D.C. **Head Lights** 6-8, 32-32 C.P.
Mazda 1158 **Stop Light** 6-8 Volts **Tail** 6-8, 3-21 C.P., D.C.
Mazda 55 **Parking Lights** 6-8, 1 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 22 Amps. Hot **Speed** 2600 R.P.M., Arm.
Regulation Voltage and Current **Cut-in** 7 Volts, 750 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .013″
Spark Plug—Size 14 M.M. **Gap** .022″
Firing Order 1-6-2-5-8-3-7-4
Timing T.D.C.

Engine **Bore** 3″ **Stroke** 4½″ **Taxable H.P.** 28.80
Piston Ring—Width Oil 2—3/16″ Comp. 2—3/32″
Diam. 3″ **Gap** Oil .009″ Comp. .009″
Oiling—Type Press. **Capacity** 7 Qts. **Pressure** 3 Lbs. Max.

Valves **Intake Timing—Open** 10½° B.T.C. **Close** 60° A.B.C.
Intake Clearance Hot .008″
Exhaust Timing—Open 50° B.B.C. **Close** 18½° A.T.C.
Exhaust Clearance Hot .010″

Carburetor Carter 344S

Steering Caster 0° Camber 1° Toe-in 0″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 20 Qts.

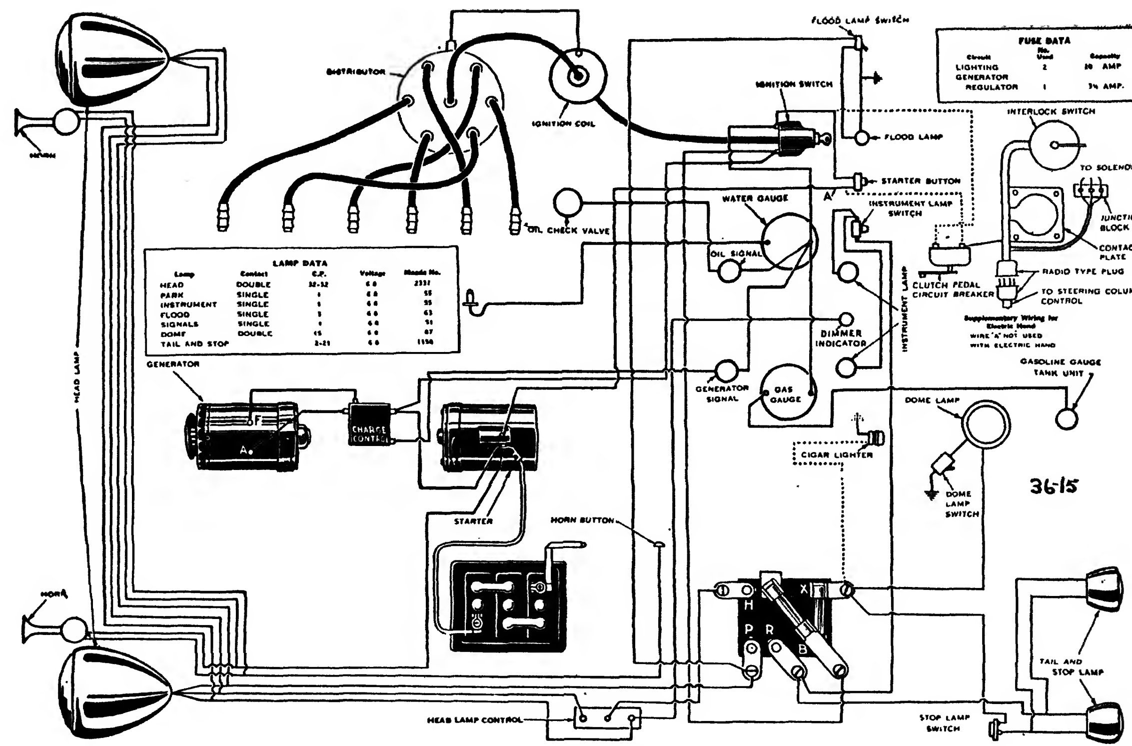
Clutch Own **Facings** Cork 6⅝″ x 9¾″ x .203″

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
t 23 15/16″ x 1¾″ x 7/32″ Clearance .010″
Rear 23 15/16″ x 1¾″ x 7/32″ Clearance .010″
Hand Rear Service

Lining Moulded Diagram 37-20



HUDSON WIRING DIAGRAM, 1936, MODEL, 6-CYLINDER
Courtesy of Hudson Motor Car Company

Hudson **Model 6-Cylinder** **Year 1936**

Battery National **Type** **Volts** 6 **Amps.** 120
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6.8, 2 C.P.
Parking Lights 6-8, 7 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite **Max. Chg. Rate** 17 Amps. **Speed** 28 M.P.H.
Regulation 3rd Brush and Voltage Control **Cut-in** 6.4 Volts
Contact Gap

Ignition Auto-Lite **Contact Breaker Gap** .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Engine **Bore** 3″ **Stroke** 5″ **Taxable H.P.** 21.6
Piston Ring—Width Oil 2—$\frac{3}{16}$″ Comp. 2—$\frac{3}{32}$″
Diam. 3″ **Gap** .009″-.011″
Oiling—Type Plunger **Capacity** 6 Qts.

Valves **Intake Timing—Open** 11° B.T.C. **Close** 60° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 50° B.B.C. **Close** 19° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Carter

Steering Caster 2°-2½° Camber 1°-1¾° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 3¼ Gals.

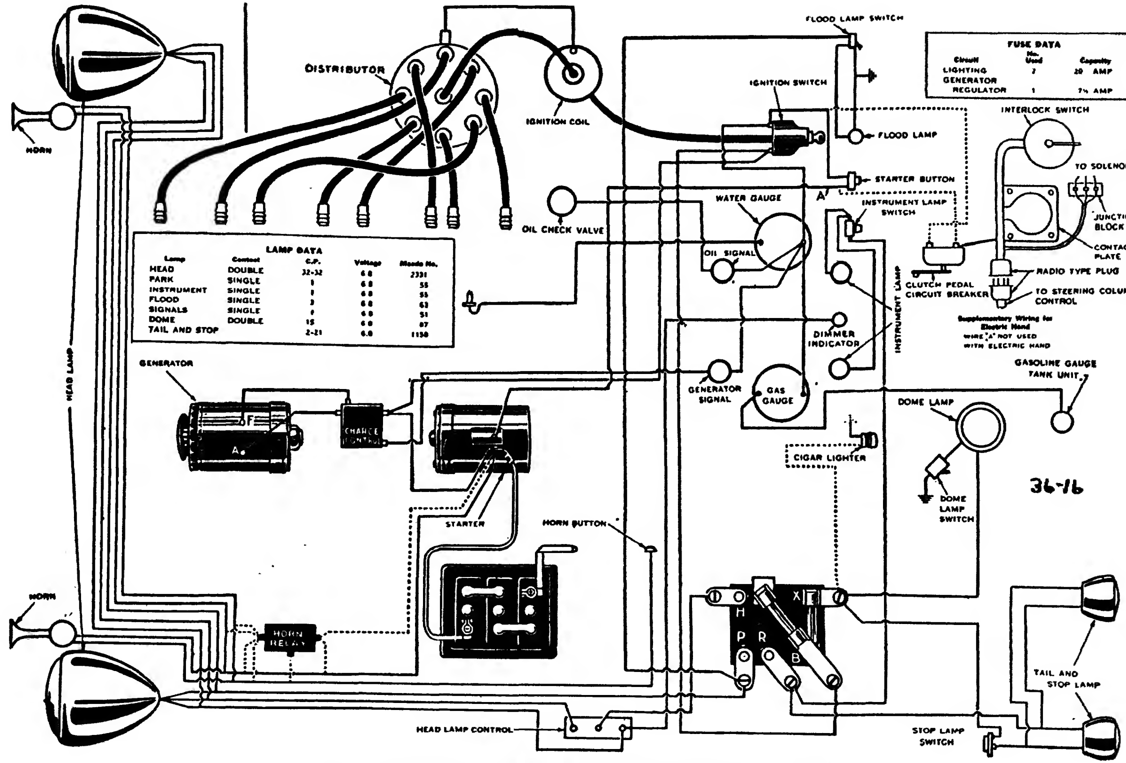
Clutch Own **Facings** Cork in Oil 5⅝″ x 8⅝″ x .203″

Gear Ratio 4.11 to 1 Spiral Gears

Axle Semi-Floating

Brakes Bendix Hydraulic
Front 22⅛″ x 2″ x $\frac{7}{32}$″ Clearance .010″
Rear 22⅛″ x 2″ x $\frac{7}{32}$″ Clearance .010″
Hand Rear Service

Lining Moulded and Woven **Diagram** 36-15



HUDSON WIRING DIAGRAM, 1936, MODEL, 8-CYLINDER
Courtesy of Hudson Motor Car Company

Hudson **Model 8-Cylinder** **Year 1936**

Battery National **Type** **Volts** 6 **Amps.** 135
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6-8, 2 C.P
Parking Lights 6-8, 1 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite **Max. Chg. Rate** 17 Amps. **Speed** 28 M.P.H.
Regulation 3rd Brush and Voltage Control **Cut-in** 6.4 Volts
Contact Gap

Ignition Auto-Lite **Contact Breaker Gap** .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing T.D.C.

Engine **Bore** 3″ **Stroke** $4\frac{1}{2}$″ **Taxable H.P.** 28.8
Piston Ring—Width Oil 2—$\frac{3}{16}$″ Comp. 2—$\frac{3}{32}$″
Diam. 3″ **Gap** .009″-.011″
Oiling—Type Plunger **Capacity** 9 Qts.

Valves **Intake Timing—Open** 11° B.T.C. **Close** 60° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 50° B.B.C. **Close** 19° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Carter

Steering Caster 2° to $2\frac{1}{2}$° Camber 1° to $1\frac{1}{2}$° Toe-in $\frac{1}{8}$″

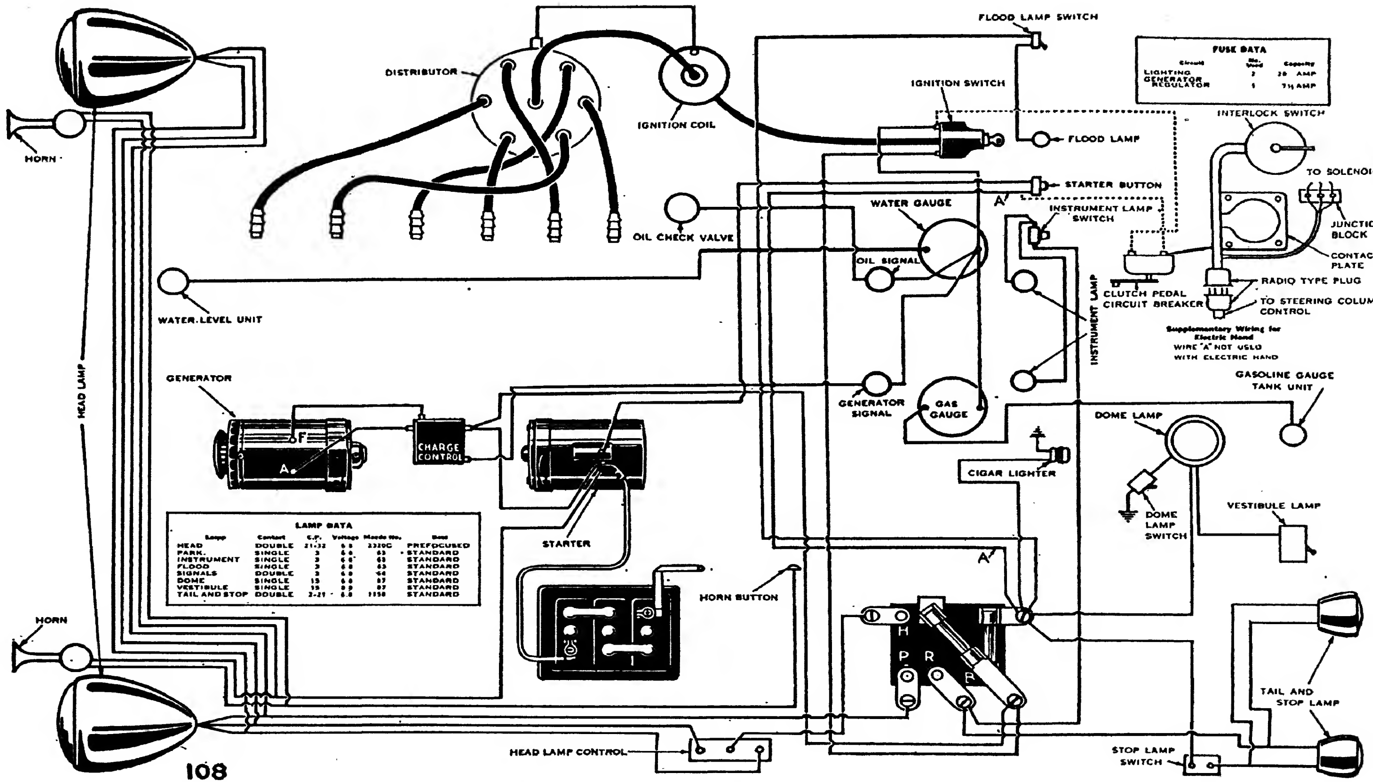
Cooling System Centrifugal **Type** Pump **Capacity** 5 Gals.

Clutch Own **Facings** Cork in Oil $6\frac{3}{8}$″ x $9\frac{3}{4}$″ x .203″

Gear Ratio $9^1/_9$ to 1 Spiral

Axle Semi-Floating

Brakes Bendix Hydraulic **Front** $23\frac{15}{16}$″ x 2″ x $\frac{7}{32}$″ Clearance .010″
Rear $23\frac{15}{16}$″ x 2″ x $\frac{7}{32}$″ Clearance .010″
Hand Rear Service
Lining Moulded and Woven Diagram 36-16



FUSE DATA

Circuit	No. Used	Capacity
LIGHTING	2	20 AMP
GENERATOR REGULATOR	1	7½ AMP

LAMP DATA

Lamp	Contact	C.P.	Voltage	Mazda No.	Base
HEAD	DOUBLE	21-32	6-8	2320C	PREFOCUSED
PARK.	SINGLE	3	6-8	63	STANDARD
INSTRUMENT	SINGLE	3	6-8	63	STANDARD
FLOOD	SINGLE	3	6-8	63	STANDARD
SIGNALS	DOUBLE	3	6-8	64	STANDARD
DOME	SINGLE	15	6-8	87	STANDARD
VESTIBULE	SINGLE	15	6-8	87	STANDARD
TAIL AND STOP	DOUBLE	3-21	6-8	1158	STANDARD

HUDSON WIRING DIAGRAM, 1935, MODEL 6-CYLINDER

Courtesy of Hudson Motor Car Company

Hudson — Model 6-Cylinder — Year 1935

Battery National **Type** **Volts** 6 **Amps.** 105
Frame Connection Positive

Lighting Mazda 2320-C **Head Lights** 6-8, 21-32 C.P.
Mazda 64, 1150 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 17 Amps. **Speed** 2400 R.P.M. Armature
Regulation 3rd Brush **Cut-in** 6.4 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 14 M.M. **Gap** .022″
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Engine **Bore** 3″ **Stroke** 5″ **Taxable H.P.** 21.6
Piston Ring—Width Oil 2—3/16″ Comp. 2—3/32″
Diam. 3″ **Gap** .009″-.011″ on All
Oiling—Type Plunger **Capacity** 6 Qts.

Valves **Intake Timing—Open** 11° B.T.C. **Close** 60° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 50° B.B.C. **Close** 19° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Carter

Steering Caster 3¼° Camber ½° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 4½ Gals.

Clutch Own **Facings** Cork 5⅜″ x 8⅝″ x .203″

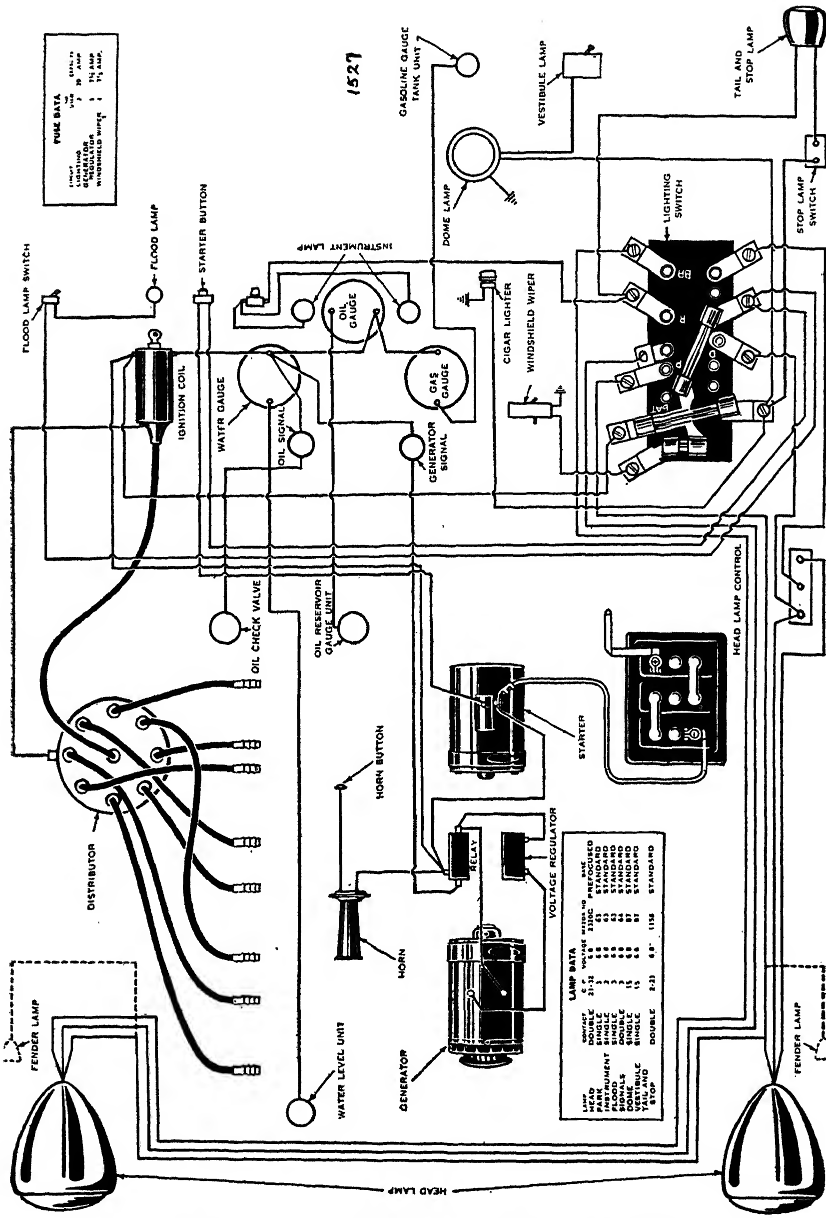
Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Mechanical Bendix
- **Front** 19 3/16″ x 2¼″ x 3/16″ Clearance Toe .008″ Heel .010″
- **Rear** 19 3/16″ x 2¼″ x 3/16″ Clearance Toe .008″ Heel .010″
- **Hand** 4 Wheels

Lining Moulded

Diagram 108



HUDSON WIRING DIAGRAM, 1934, MODELS LTS, LL, AND LT

Courtesy of Hudson Motor Car Company

Hudson Models LTS, LL and LT Year 1934

Battery Exide **Type** XTL-19-17F **Volts** 6 **Amps.** 120
Frame Connection Positive

Lighting
Mazda 2320-C **Head Lights** 6-8, 32-21 C.P.
Mazda 63, 1158 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Cold **Max. Chg. Rate** 22 Amps. **Speed** 2200 R.P.M.
Regulation 3rd Brush **Cut-in** 6.4 Volts
Relay Air Gap **Contact Gap**

Ignition
Contact Breaker Gap .018″-.020″
Spark Plug—Size 14 MM. **Gap** .022″
Firing Order 1-6-2-5-8-3-7-4
Timing T.D.C.

Engine **Bore** 3″ **Stroke** 4½″ **Taxable H.P.** 28.80
Piston Ring—Width Oil 1—⅛″, 1—3/16″ Comp. 2—3/32″
Diam. 3″ **Gap** .006″ on All
Oiling—Type Splash **Capacity** 7 Qts.

Valves
Intake Timing—Open 11° B.T.C. **Close** 60° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 50° B.B.C. **Close** 19° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Carter W1

Steering Caster 1½° Camber 2° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump

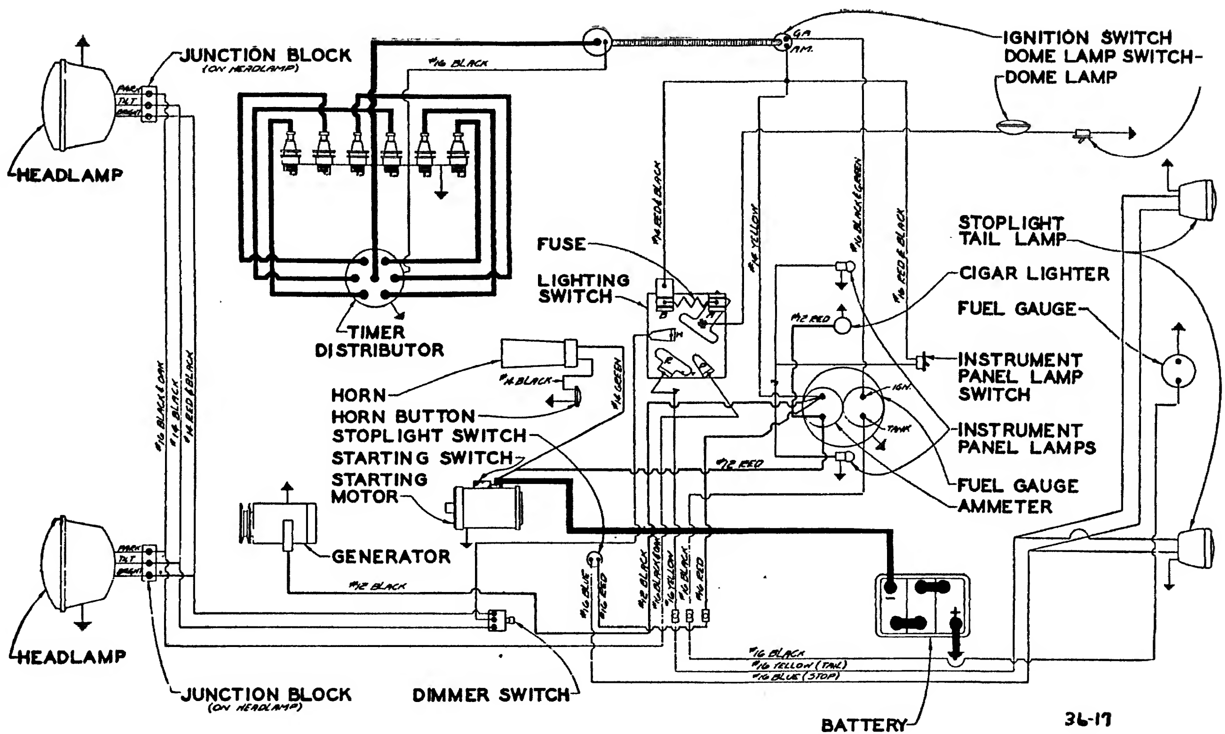
Clutch Own **Facing** Cork 6½″ x 10″ x .203″

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes
Bendix
Mechanical
Front 19 3/16″ x 2¼″ x 3/16″ Clearance Heel .014″ Toe .008″
Rear 19 3/16″ x 2¼″ x 3/16″ Clearance Heel .014″ Toe .008″
Hand 4 Wheels
Lining Moulded

Diagram 1527



HUPMOBILE WIRING DIAGRAM, 1936, SERIES 618G

Courtesy of Hupp Motor Car Corporation

Hupmobile Model Series 618G Year 1936

Battery W.S.-2-15 **Type** 2-15 **Volts** 6 **Amps.** 100
Frame Connection Positive

Lighting Tung-sol or Mazda Double Contact
Head Lights 6-8, 21-32 C.P.
Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max Chg. Rate 15-18 Amps. **Speed** 30 M.P.H.
Regulation 3rd Brush **Cut-in** 6.7 Volts
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .018″-.020″
Spark Plug—Size 18 M.M. **Gap** .026″-.030″
Firing Order 1-5-3-6-2-4
Timing 7° B.T.C. Full Advance

Engine **Bore** 3.5″ **Stroke** 4¼″ **Taxable H.P.** 29.42
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3.5″ **Gap** Oil .007″-.015″ Comp. .007″-.012″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 2° B.T.C. **Close** 51° A.B.C.
Intake Clearance .010″
Exhaust Timing—Open 44° B.B.C. **Close** 3° A.T.C.
Exhaust Clearance .013″

Carburetor Stromberg & Carter

Steering Caster 1½° Camber 1° Toe-in ⅛″±1/16″

Cooling System Centrifugal **Type** Pump **Capacity** 5 Gals.

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio 4.3 to 1 Spiral Gears

Axle Spicer Semi-Floating

Brakes Lockheed Hydraulic
Front 20⅞″ x 2″ x 3/16″ **Clearance** Heel .005″ Toe .010″
Rear 20⅞″ x 2″ x 3/16″
Hand Rear Service
Lining Moulded **Diagram** 36-17

Hupmobile Model 417, Series W Year 1934

Battery	Willard	**Type** WMB-17	**Volts** 6	**Amps.** 90
		Frame Connection	Positive	

Lighting	Mazda 2320-C	**Head Lights**	6-8, 32-21 C.P.
	Mazda 63, 87	**Dash, Tail and Stop**	6-8, 3-3-15 C.P.
	Mazda 63	**Side Lights**	6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Cold **Max. Chg. Rate** 20 Amps. **Speed** 2250 R.P.M.
Regulation 3rd Brush **Cut-in** 7-7.5 Volts
Relay Air Gap .010″-.030″ **Contact Gap** .025″-.035″

Ignition **Contact Breaker Gap** .015″-.018″
Spark Plug—Size 18 MM. **Gap** .028″
Firing Order 1-5-3-6-2-4
Timing 7° B.T.C.

Engine **Bore** 3½″ **Stroke** 3⅞″ **Taxable H.P.** 29.4
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3½″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 2° B.T.C. **Close** 51° A.B.C.
Intake Clearance .010″ Hot
Exhaust Timing—Open 44° B.B.C. **Close** 3° A.T.C.
Exhaust Clearance .013″ Hot

Carburetor Stromberg EX32

Cooling System Centrifugal **Type** Pump **Capacity** 4 Gals.

Clutch Borg & Beck **Facing** Moulded 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 48 Pinion 11 Spiral Gears

Axle Spicer Semi-Floating

Brakes Midland Mechanical
Front 1¾″ x 3/16″
Rear 1¾″ x 3/16″
Hand 4 Wheels
Lining Moulded

Hupmobile Model K, Series 321 Year 1933

Battery	Willard	**Type** WH-2-15	**Volts** 6	**Amps.** 119
		Frame Connection	Positive	

Lighting	Double Contact	**Head Lights**	6-8, 32-32 C.P.
	Single Contact	**Dash, Tail and Stop**	6-8, 3-3-15 C.P.
	Single Contact	**Side Lights**	6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 12.4 Amps. **Speed** 2150 R.P.M.
Regulation 3rd Brush **Cut-in** 7-7.5 Volts
Relay Air Gap .010″-.030″ **Contact Gap** .025″-.035″

Ignition **Contact Breaker Gap** .015″-.018
Spark Plug—Size 18 MM. **Gap** .026″-.030″
Firing Order 1-5-3-6-2-4
Timing 7° B.T.C. Full Advance

Engine **Bore** 3⅜″ **Stroke** 4¼″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 2—⅛″ Comp. 2—⅛″
Diam. 3⅜″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 2° B.T.C. **Close** 51° A.B.C.
Intake Clearance .010″ Hot
Exhaust Timing—Open 44° B.B.C. **Close** 3° A.T.C.
Exhaust Clearance .013″ Hot

Carburetor Carter W1

Steering Caster 1½° Camber 1½° Toe-in 1/16″

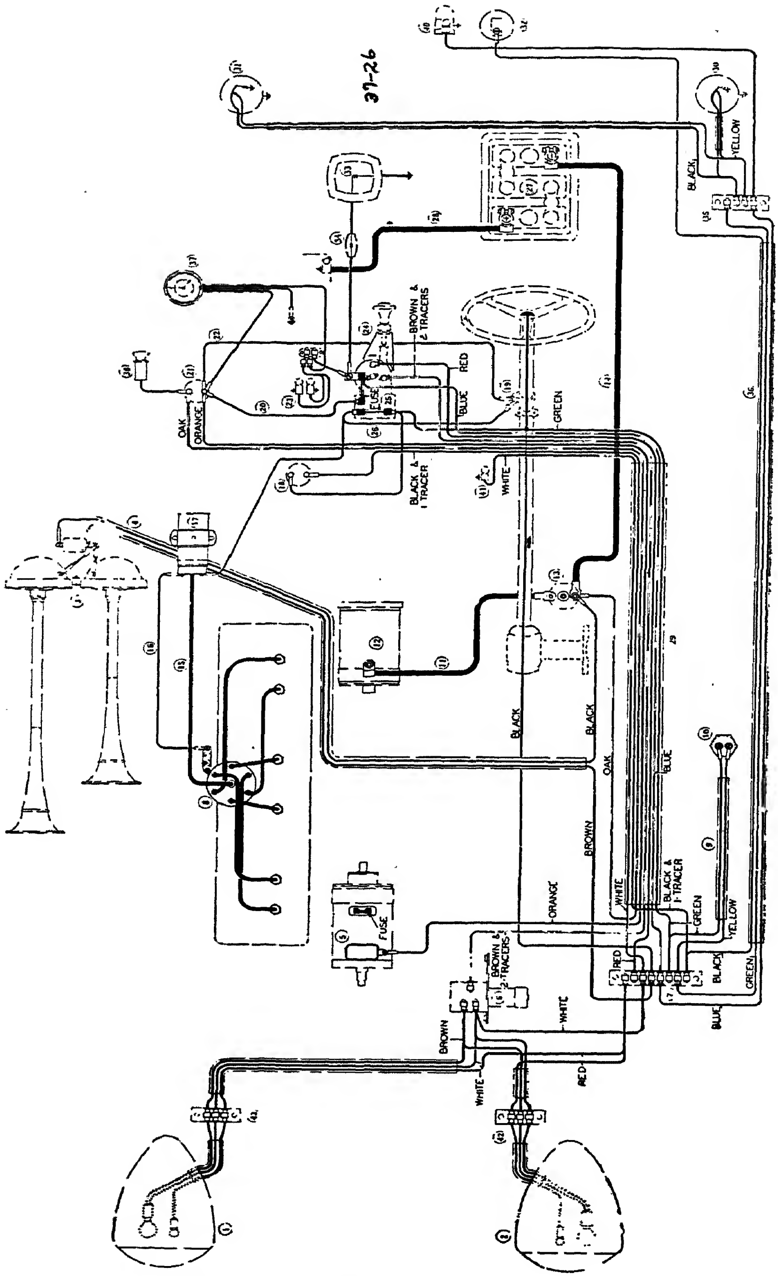
Cooling System Centrifugal **Type** Pump **Capacity** 4 Gals.

Clutch Borg & Beck **Facing** Moulded 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 52 Pinion 11 Hypoid

Axle Salisbury Semi-Floating

Brakes Midland Mechanical	**Front**	33 3/16″ x 2″ x .210″	Clearance 1/16″
	Rear	33 3/16″ x 2″ x .210″	Clearance 1/16″
	Hand	4 Wheels	
	Lining	Moulded	



LaFAYETTE WIRING DIAGRAM, 1937, MODEL 400
Courtesy of Nash Motors Company

La Fayette Model 400 Year 1937

Battery U.S.L. **Type** **Volts** 6-8 **Amps.** 100
Frame Connection Positive

Lighting **Head Lights** 6-8, 32-32 C.P.
Double Contact **Stop Light** 6-8 Volts **Tail** 6-8, 3 C.P., 21 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 18 Amps. Hot **Speed** 2800 R.P.M., Arm.
Regulation **Cut-in** 7 Volts, 775 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 10° B.T.C.

Engine **Bore** 3⅜″ **Stroke** 4⅜″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 2—⅛″, 3/16″ Comp. 2—⅛″
Diam. 3⅜″ **Gap** Oil .010″ Comp. .010″
Oiling—Type Gear Pump **Capacity** 6 Qts. **Pressure** 30 Lbs. @ 20 M.P.H.

Valves **Intake Timing—Open** **Close**
Intake Clearance Hot .015″ Operating, .015″ Timing
Exhaust Timing—Open **Close**
Exhaust Clearance Hot .015″ Operating, .015″ Timing

Carburetor Stromberg EX22

Steering Caster 2½° Camber 1½° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 20 Qts.

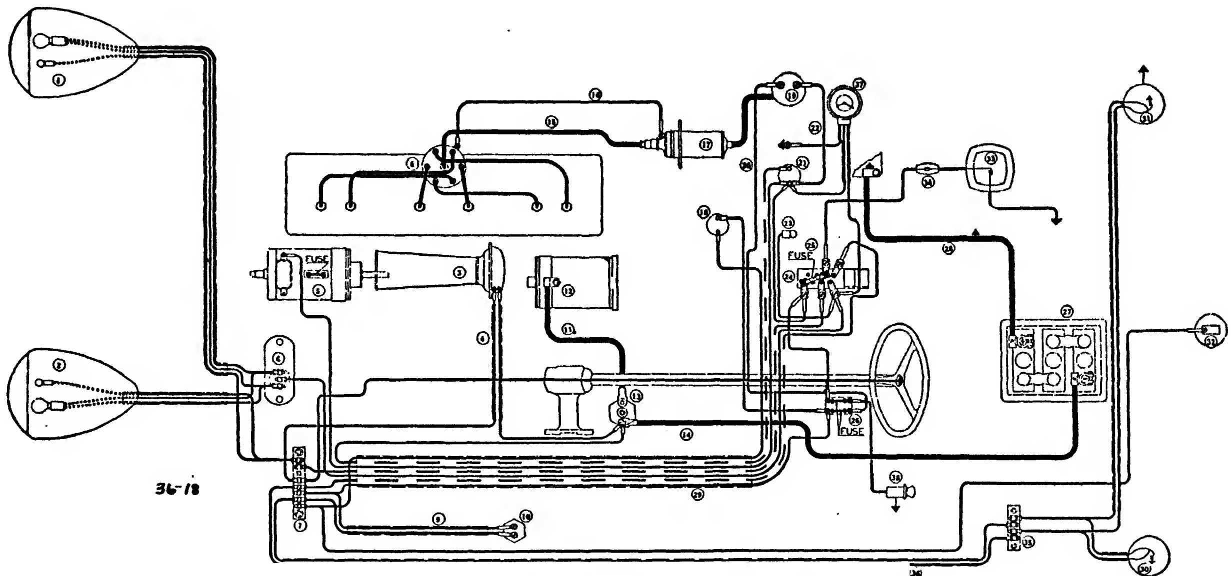
Clutch Borg & Beck **Facings** Woven 5⅝″ x 9¼″ x ⅛″ 2 Required

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 22 1/16″ x 2″ x 3/16″ Clearance .010″
Rear 22 1/16″ x 2″ x 3/16″ Clearance .010″
Hand Rear Service
Lining Moulded

Diagram 37-26



LA FAYETTE WIRING DIAGRAM, 1936, MODEL, 6-CYLINDER
Courtesy of Nash Motors Company

La Fayette **Model 6-Cylinder** **Year 1936**

Battery Globe **Type** **Volts** 6 **Amps.** 110
Frame Connection Positive

Lighting
Head Lights 6-8, 32-32 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 18 Amps. Hot **Speed** 24 M.P.H.
Regulation **Cut-in** 7 Volts
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 10° B.T.C. Retard

Engine **Bore** 3¼″ **Stroke** 4⅜″ **Taxable H.P.** 25.35
Piston Ring—Width Oil 1—⅛″, 1—3/16″ Comp. 2—⅛″
Diam. 3¼″ **Gap** .010″-.025″
Oiling—Type Pump **Capacity** 5¾ Qts.

Valves **Intake Timing—Open** **Close**
Intake Clearance .015″
Exhaust Timing—Open **Close**
Exhaust Clearance .015″

Carburetor Marvel B2

Steering Caster 2° to 4° Camber 0° to 1½° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 19 Qts.

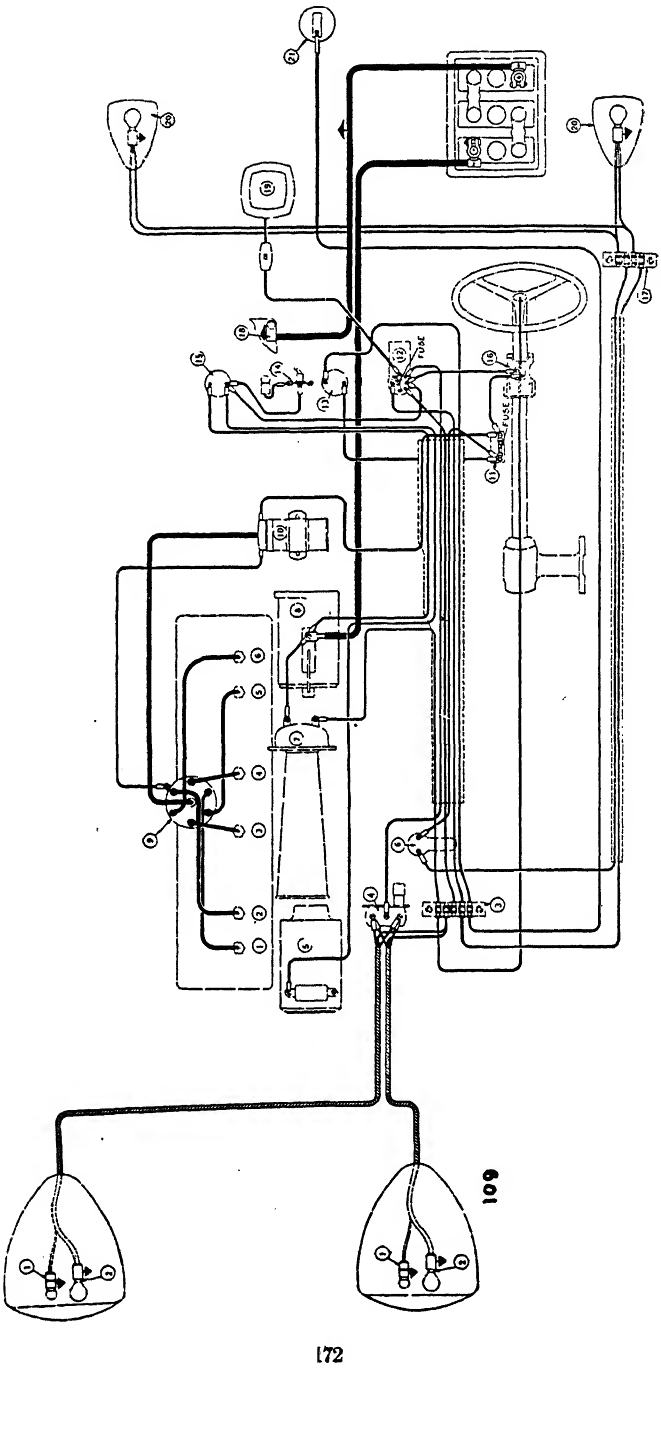
Clutch Borg & Beck **Facings** Woven 5¾″ x 9″ x .133″ 2 Required

Gear Ratio 4.44 to 1 Spiral Gears

Axle Semi-Floating

Brakes Bendix Hydraulic
Front 2111/16″ x 2″ x 3/16″ Clearance .010″
Rear 2111/16″ x 2″ x 3/16″ Clearance .010″
Hand Service Brakes Rear Wheels

Lining Moulded Diagram 36-18



LA FAYETTE DIAGRAM, 1935, SERIES 3510
Courtesy of Nash Motors Company

La Fayette Model Series 3510 Year 1935

Battery Globe **Type** **Volts** 6 **Amps.** 110

Frame Connection Positive

Lighting	Double Contact	**Head Lights**	6-8, 32-21 C.P.
	Single Contact	**Dash**	6-8, 3 C.P.
	Double Contact	**Tail and Stop**	6-8, 3-21 C.P.
	Single Contact	**Side Lights**	6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 17 Amps. **Speed** 24 M.P.H.

Regulation 3rd Brush **Cut-in** 7 Volts

Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .020″

Spark Plug—Size 18 M.M. **Gap** .025″

Firing Order 1-5-3-6-2-4

Timing "IGN" Mark on Front Vibration Damper under Pointer

Engine **Bore** 3¼″ **Stroke** 4⅜″ **Taxable H.P.** 25.35

Piston Ring—Width Oil 1—⅛″, 1—³⁄₁₆″ Comp. 2—⅛″
Diam. 3¼″ **Gap** .010″-.025″ on All

Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** **Close**

Intake Clearance .015″

Exhaust Timing—Open **Close**

Exhaust Clearance .015″

Carburetor Marvel

Steering Caster 0°-1° Camber 0°-1½° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 19 Qts.

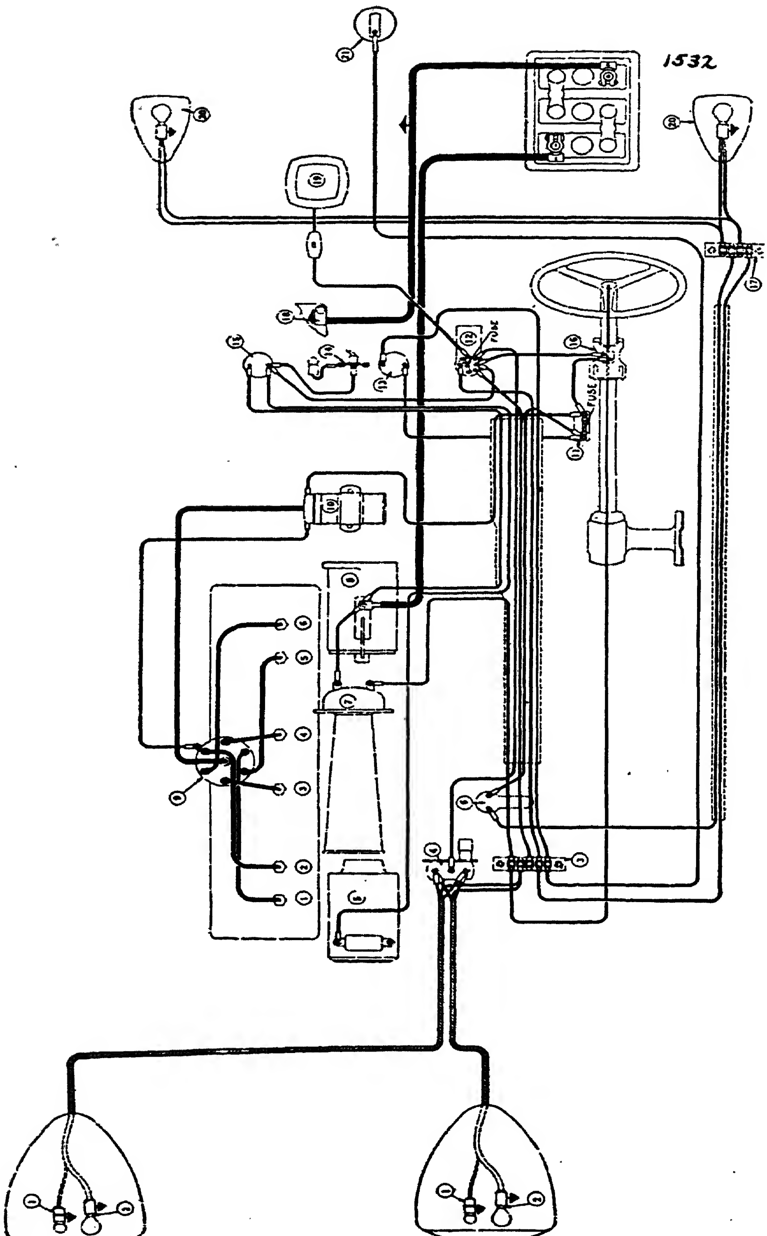
Clutch Borg & Beck **Facings** Moulded 5¾″ x 9″ x .133″ 2 Required

Gear Ratio Ring Gear 47 Pinion 10 Spiral Gears

Axle Own Semi-Floating

Brakes Mechanical Bendix
Front 23¾″ x 1¾″ x 5/32″ Clearance .010″
Rear 23¾″ x 1¾″ x 5/32″ Clearance .010″
Hand 4 Wheels
Lining Moulded

Diagram 109



LA FAYETTE WIRING DIAGRAM, 1934, MODEL SERIES 110
Courtesy of Nash Motors Company

La Fayette   Model Series 110   Year 1934

Battery Globe **Type No.** 71 **Volts** 6 **Amps.** 102
Frame Connection Positive

Lighting Mazda 1116 **Head Lights** 6-8, 32-21 C.P.
Mazda 63, 1158 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 17 Amps. **Speed** 1700 R.P.M.
Regulation 3rd Brush **Cut-in** 7-7.5 Volts
Relay Air Gap .010″-.030″ **Contact Gap** .025″-.035″

Ignition **Contact Breaker Gap** .018″-.020″
Spark Plug—Size 18 MM. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing "IGN" on Vibration Damper to Pointer on Cover

Engine **Bore** 3¼″ **Stroke** 4⅜″ **Taxable H.P.** 25.35
Piston Ring—Width Oil 1—⅛″, 1—³⁄₁₆″ Comp. 2—⅛″
Diam. 3¼″ **Gap** .010″ on All
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** **Close**
Intake Clearance .008″ Hot
Exhaust Timing—Open **Close**
Exhaust Clearance .008″ Hot

Carburetor Marvel

Steering Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 4¾ Gals.

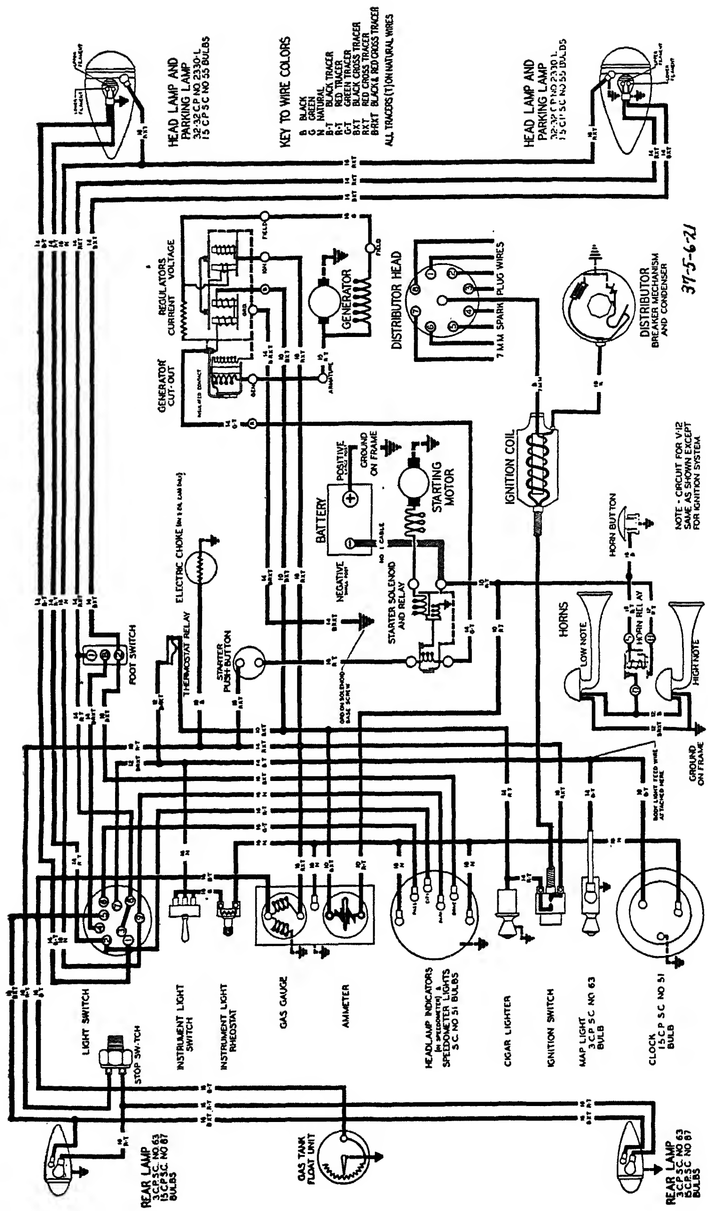
Clutch Borg & Beck **Facing** Moulded 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 47 Pinion 10 Spiral Gears

Axle Spicer Semi-Floating

Brakes Bendix Mechanical
Front 23¾″ x 1¾″
Rear 23¾″ x 1¾″
Hand 4 Wheels
Lining Moulded

Diagram 1532



LaSALLE WIRING DIAGRAM, 1937, MODEL V-8

Courtesy of Cadillac Motor Car Company

La Salle **Model V-8** **Year 1937**

Battery Delco-Remy **Type** **Volts** 6-8 **Amps.** 110
Frame Connection Positive

Lighting Mazda 2330-L D.C. **Head Lights** 6-8, 32-32 C.P.
Mazda 87 **Stop Light** 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Mazda 55 **Parking Lights** 6-8, 1.5 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 28 Amps. Hot **Speed** 4000 R.P.M., Arm.
Regulation Voltage **Cut-in** 6.5 Volts
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .013″
Spark Plug—Size 14 M.M. **Gap** .027″
Firing Order 1L-4R-4L-2L-3R-3L-2R-1R
Timing 5° B.T.C.

Engine **Bore** 3⅜″ **Stroke** 4½″ **Taxable H.P.** 36.45
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3⅜″ **Gap** Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 7 Qts.
Pressure 30 Lbs. @ 60 M.P.H.

Valves **Intake Timing—Open** T.D.C. **Close** 42° A.B.C.
Intake Clearance Zero
Exhaust Timing—Open 52° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance Zero

Carburetor Stromberg AA25

Steering Caster ¼° Camber ¼° Toe-in 0″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 25 Qts.

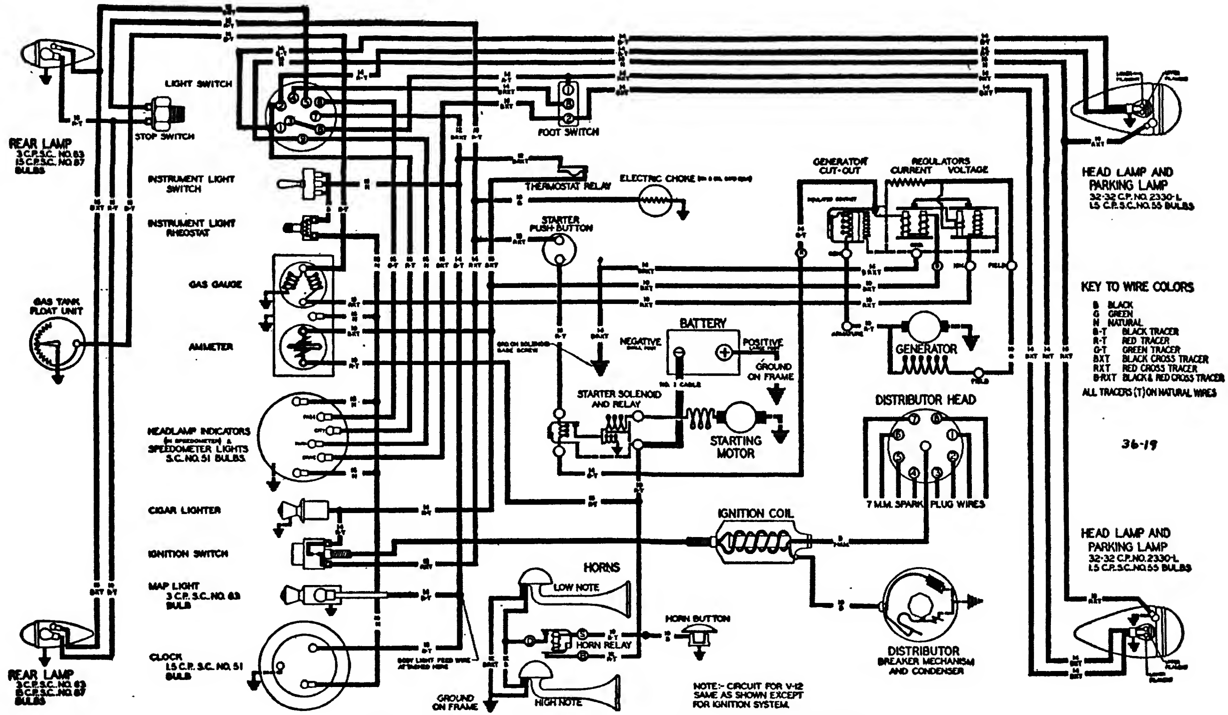
Clutch Long **Facings** Woven 6½″ x 10½″ x .137″ 2 Required

Gear Ratio Ring Gear 47 Pinion 12 Hypoid Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 25⅞″ x 2″ x 3/16″ Clearance .010″
Rear 25⅞″ x 2″ x 3/16″ Clearance .010″
Hand Rear Service

Lining Moulded **Diagram** 37-21



LA SALLE WIRING DIAGRAM, 1936, MODEL, 8-CYLINDER

Courtesy of Cadillac Motor Car Company

La Salle **Model 8-Cylinder** **Year 1936**

Battery Delco-Remy **Type** **Volts** 6 **Amps.** 107

Frame Connection Positive

Lighting Mazda 2330-L **Head Lights** 6-8, 32-32 C.P.

Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.

Parking Lights 6-8, 2 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy **Max. Chg. Rate** 22 Amps. Hot **Speed** 1900 R.P.M.

Regulation **Cut-in** 6.8 Volts

Relay Air Gap **Contact Gap**

Ignition Delco-Remy **Contact Breaker Gap** .018″ to .024

Spark Plug—Size 14 M.M. **Gap** .025″-.027″

Firing Order 1-6-2-5-8-3-7-4

Timing 8° B.T.C. Full Advance

Engine **Bore** 3″ **Stroke** $4\frac{3}{8}$″ **Taxable H.P.** 28.80

Piston Ring—Width Oil 1—.154″, 1—.123″ Comp. $\frac{1}{8}$″

Diam. 3″ **Gap** .007″

Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 37° A.B.C.

Intake Clearance .006″ Hot

Exhaust Timing—Open 34° B.B.C. **Close** 3° A.T.C.

Exhaust Clearance .009″ Hot

Carburetor Stromberg EE15

Steering Caster 2° Camber 1° Toe-in $\frac{1}{8}$″

Cooling System Pump **Type** Centrifugal **Capacity** 16 Qts.

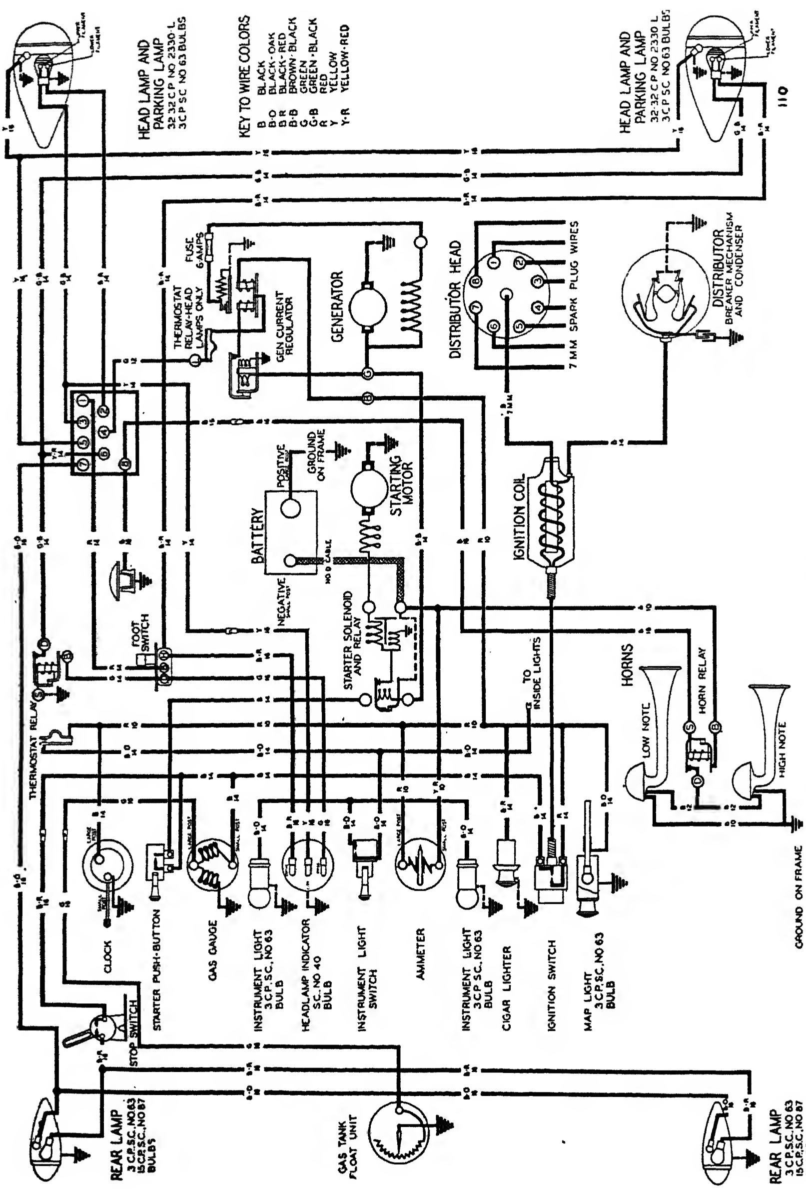
Clutch Long **Facings** Woven 6″ x 10″ x $\frac{1}{8}$″ 2 Required

Gear Ratio 4.5 to 1 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
- **Front** $25\frac{7}{8}$″ x 2″ x $\frac{3}{16}$″ **Clearance** .010″
- **Rear** $25\frac{7}{8}$″ x 2″ x $\frac{3}{16}$″ **Clearance** .010″
- **Hand** Rear Wheels

Lining Moulded and Woven **Diagram** 36-19



LA SALLE WIRING DIAGRAM, 1935, MODEL 350

Courtesy of Cadillac Motor Car Company

La Salle — Model 350 — Year 1935

Battery Delco — **Type** 17DW — **Volts** 6 — **Amps.** 130
Frame Connection Positive

Lighting
- Mazda 2330L — **Head Lights** — 6-8, 32-32 C.P.
- Mazda 63L, 87L — **Dash, Tail and Stop** — 6-8, 3-3-15 C.P.
- Mazda 63L — **Side Lights** — 6-8, 3 C.P.

Starter and Generator

Generator Hot — **Max. Chg. Rate** 16-25 Amps. — **Speed**
Regulation 3rd Brush — **Cut-in** 6.75-7.25 Volts
Relay Air Gap .012″-.017″ — **Contact Gap** .015″-.025″

Ignition
Contact Breaker Gap .018″-.024″
Spark Plug—Size 18 M.M. — **Gap.** .025″-.027″
Firing Order 1-6-2-5-8-3-7-4
Timing 8° B.T.C.

Engine **Bore** 3″ — **Stroke** 4¼″ — **Taxable H.P.** 28.80
Piston Ring—Width Oil 1—⅛″, 1—5/32″ Comp. 2—⅛″
Diam. 3″ — **Gap** .007″ on All
Oiling—Type Pump — **Capacity** 7 Qts.

Valves **Intake Timing—Open** T.D.C. — **Close** 42° A.B.C.
Intake Clearance .0118″
Exhaust Timing—Open 40° B.B.C. — **Close** 10° A.T.C.
Exhaust Clearance .0118″

Carburetor Stromberg EE23

Steering Caster 2° — Camber ½° — Toe-in 1/16″

Cooling System Centrifugal — **Type** Pump — **Capacity** 4.6 Gals.

Clutch Borg & Beck — **Facings** Moulded 6⅛″ x 9⅞″ x .133″ — 2 Required

Gear Ratio Ring Gear 43 — Pinion 9 — Spiral Gear

Axle Own — Semi-Floating

Brakes Hydraulic Bendix
- **Front** 25⅞″ x 2″ x 3/16″ — Clearance .010″
- **Rear** 25⅞″ x 2″ x 3/16″ — Clearance .010″
- **Hand** Rear Service

Lining Moulded

Diagram 110

La Salle Model 350, Series 50 Year 1934

Battery Delco **Type** 17-DW **Volts** 6 **Amps.** 130
Frame Connection Positive

Lighting Mazda 2330-L **Head Lights** 6-8, 32-32 C.P.
Mazda 63, 87 **Dash, Tail and Stop** 6-8, 3-3-15 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 9-11 Amps. **Speed** 1400 R.P.M.
Regulation External Regulator **Cut-in** 6.75-7.25 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 18 MM. **Gap** .026″
Firing Order 1-6-2-5-8-3-7-4
Timing 8° B.T.C.

Engine **Bore** 3″ **Stroke** 4¼″ **Taxable H.P.** 28.80
Piston Ring—Width Oil 1—.123″ Comp. 3—3/32″
Diam. 3″ **Gap** Comp. .007″
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 37° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 34° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .009″ Hot

Carburetor Stromberg

Cooling System Centrifugal **Type** Pump

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 43 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Bendix Hydraulic
Front 1¾″
Rear 1¾″
Hand Rear Service

Lining Moulded

La Salle **Model 345-C** **Year 1933**

Battery Delco **Type** 17-CF **Volts** 6 **Amps.** 130
Frame Connection Positive

Lighting Double Contact **Head Lights** 6-8, 32-32 C.P.
Single Contact **Dash, Tail and Stop** 6-8, 3-3-15 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 14-15 Amps. **Speed** 1800-2000 R.P.M.
Regulation 3rd Brush **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 18 MM. **Gap** .025″-.028″
Firing Order 1R-1L-4R-4L-2L-3R-3L-2R
Timing 9° 12′ Flywheel or .039″ Piston B.T.C.

Engine **Bore** 3⅜″ **Stroke** 4$^{15}/_{16}$″ **Taxable H.P.** 36.45
Piston Ring—Width Oil 1—$\frac{3}{16}$″, 1—$\frac{5}{32}$″ Comp. 1—⅛″, 2—$\frac{3}{32}$″
Diam. 3⅜″ **Gap** Oil .003″ Comp. .005″
Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** 6° B.T.C. **Close** 42° A.B.C.
Intake Clearance .004″ Hot
Exhaust Timing—Open 38° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance .006″ Hot

Carburetor Own

Steering Caster 2½° Camber 1½° Toe-in ⅛″

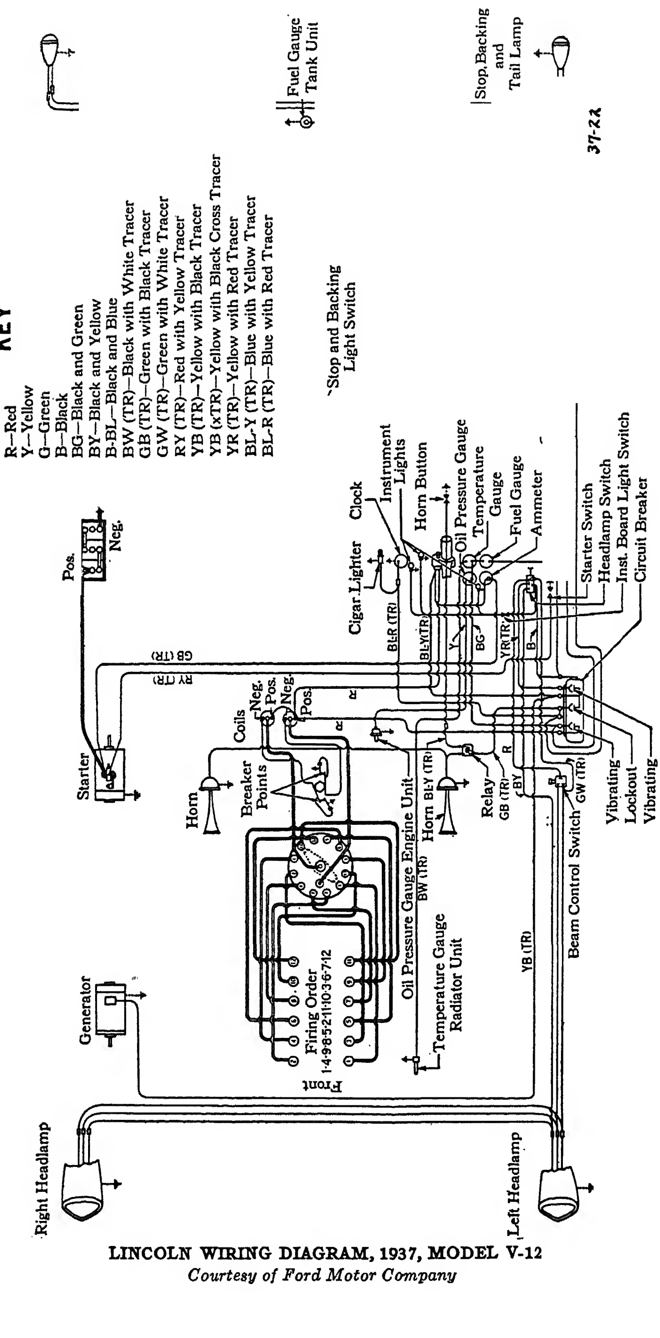
Cooling System Centrifugal **Type** Pump **Capacity** 6½ Gals.

Clutch Own **Facings** Woven 5½″ x 10″ x .135″ 4 Required

Gear Ratio Ring Gears 46 Pinion 10 Spiral Gears

Axle Own ¾ Floating

Brakes Own Mechanical and Booster
Front 29¾″ x 2″ x $\frac{3}{16}$″ Clearance .007″
Rear 29¾″ x 2″ x $\frac{3}{16}$″ Clearance .007″
Hand Rear Service
Lining Semi-Moulded



LINCOLN WIRING DIAGRAM, 1937, MODEL V-12

Courtesy of Ford Motor Company

Lincoln **Model V-12** **Year 1937**

Battery Exide **Type** **Volts** 6-8 **Amps.** 147

Frame Connection Negative

Lighting **Head Lights** 6-8, 32-32 C.P.

Stop Light 6-8, 21 C.P. **Tail** 6-8, 3 C.P.

Parking Lights 6-8, 1.5 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 22 Amps. Hot **Speed** 1300 R.P.M., Arm.

Regulation Voltage **Cut-in** 7 Volts, 460 R.P.M.

Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″

Spark Plug—Size 18 M.M. **Gap** .025″

Firing Order 1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R

Timing T.D.C.

Engine **Bore** 3⅛″ **Stroke** 4½″ **Taxable H.P.** 46.80

Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3⅛″ Gap Oil .007″ Comp. .008″

Oiling—Type Gear Pump **Capacity** 12 Qts. **Pressure** 40 Lbs. @ 50 M.P.H.

Valves **Intake Timing—Open** 21° B.T.C. **Close** 47° A.B.C.

Intake Clearance Hot .004″

Exhaust Timing—Open 57° B.B.C. **Close** 11° A.T.C.

Exhaust Clearance Hot .006″

Carburetor Stromberg EE1

Steering Caster 1½° Camber 1° Toe-in 1/16″

Cooling System—Centrifugal **Type** Pump, Belt **Capacity** 32 Qts.

Clutch Long **Facings** Woven 7″ x 12″ x .137″ 2 Required

Gear Ratio Ring Gear 55 Pinion 12 Spiral Gears

Axle Timken Full-Floating

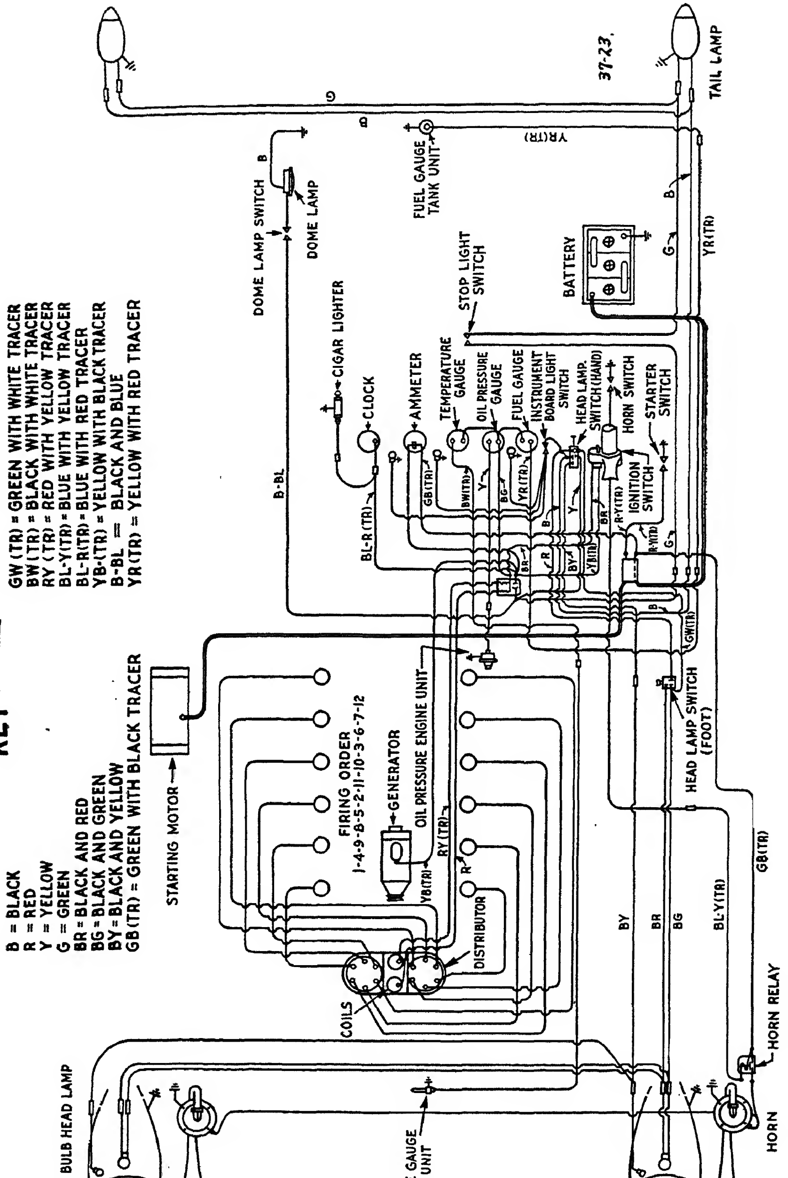
Brakes Bendix Mechanical
Front 33½″ x 2½″ x ¼″ Clearance .010″

Rear 33½″ x 2½″ x ¼″ Clearance .010″

Hand All Four Wheels

Lining Moulded

Diagram 37-22



LINCOLN-ZEPHYR WIRING DIAGRAM, 1937, 12-CYLINDER

Courtesy of Ford Motor Company

Lincoln-Zephyr **Model 12-Cylinder** **Year 1937**

Battery Own **Type** **Volts** 6-8 **Amps.** 96
Frame Connection Positive

Lighting Double Filament **Head Lights** 6-8, 32-32 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 1.5 C.P.

Starter and Generator Own

Generator Own **Max. Chg. Rate** 15 Amps. Hot **Speed** 1800 R.P.M., Arm.
Regulation **Cut-in** 7 Volts, 10 M.P.H.
Relay Air Gap **Contact Gap**

Ignition Own **Contact Breaker Gap** .014″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R
Timing 4° A.T.C.

Engine **Bore** 2¾″ **Stroke** 3¾″ **Taxable H.P.** 36.30
Piston Ring—Width Oil 1—5/32″ Comp. 2—3/32″
Diam. 2¾″ **Gap** Oil .008″ Comp. .008″
Oiling—Type Gear Pump **Capacity** 6 Qts. **Pressure** 30 Lbs. @50 M.P.H.

Valves **Intake Timing—Open** 19½° B.T.C. **Close** 54½° A.B.C.
Intake Clearance Cold .013″ Operating and Timing
Exhaust Timing—Open 57½° B.B.C. **Close** 16½° A.T.C.
Exhaust Clearance Cold .013″ Operating and Timing

Carburetor Stromberg EE1

Steering Caster 7° Camber ¾° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 27 Qts.

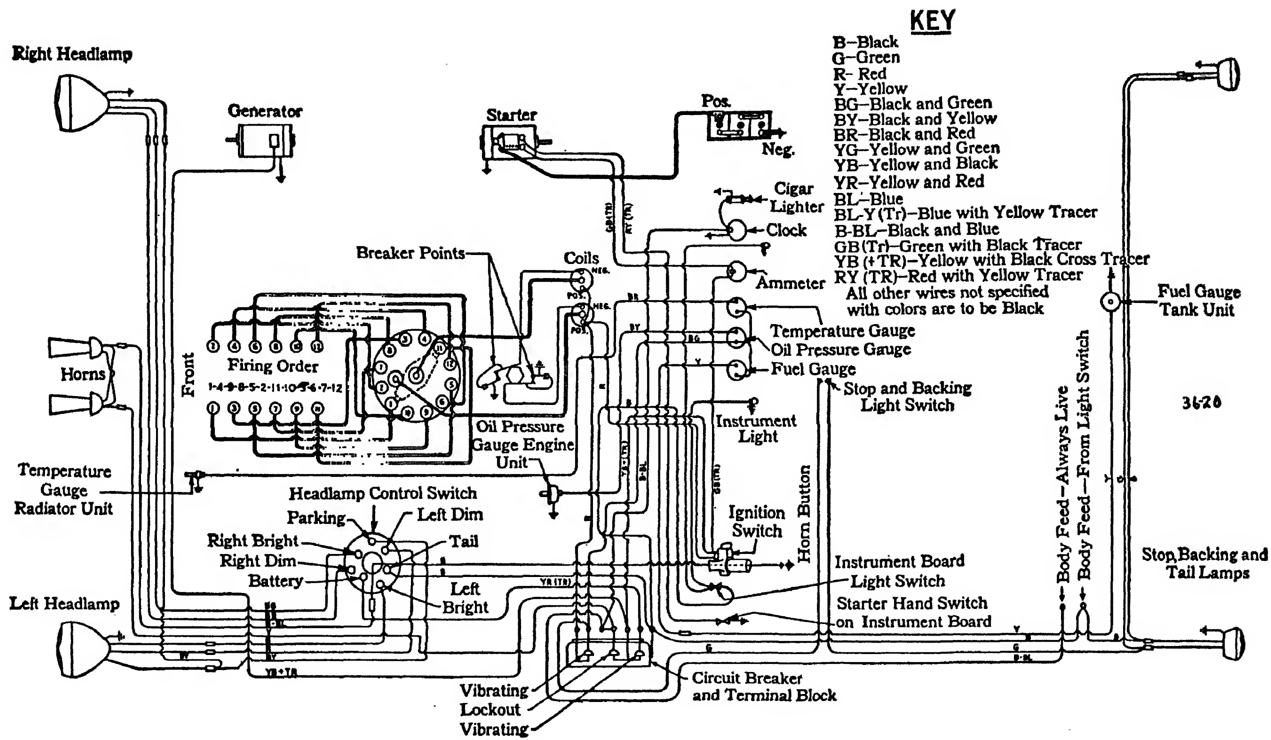
Clutch Long **Facings** Woven 6″ x 10″ x .137″ 2 Required

Gear Ratio Ring Gear 39 Pinion 9 Spiral Gears

Axle Own ¾-Floating

Brakes Bendix Mechanical
- **Front** 23⅞″ x 1¾″ x 7/32″ Clearance .010″
- **Rear** 23⅞″ x 1¾″ x 7/32″ Clearance .010″
- **Hand** All Four Wheels

Lining Moulded **Diagram** 37-23



LINCOLN WIRING DIAGRAM, 1936, MODEL, 12-CYLINDER

Courtesy of Ford Motor Company

Lincoln **Model 12-Cylinder** **Year 1936**

Battery Exide **Type** X-21-L **Volts** 6 **Amps.** 147
Frame Connection Negative

Lighting Two Filament **Head Lights** 6-8, 32-21 C.P.
Stop Light 6-8, 21-3 C.P. **Tail** 6-8, 21-3 C.P.
Parking Lights 6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 16 Amps. Hot **Speed** 20-25 M.P.H.
Regulation Field Brush **Cut-in** 6.75-7.5 Volts
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order 1-4-9-8-5-2-11-10-3-6-7-12
Timing Initial Adv. D.C. Max. 17° Crankshaft

Engine **Bore** 3.125″ **Stroke** 4.50″ **Taxable H.P.** 46.8
Piston Ring—Width Oil 2—.1545″-.1550″ Comp.2—.1235″-.1240″
Diam. 3.125″ **Gap** Oil .007″-.015″ Comp. .008″-.015″
Oiling—Type Pressure **Capacity** 12 Qts.

Valves **Intake Timing—Open** 21° B.T.C. **Close** 47° A.B.C.
Intake Clearance .004″
Exhaust Timing—Open 57° B.B.C. **Close** 11° A.T.C.
Exhaust Clearance .006″

Carburetor Stromberg EE1

Steering Caster 1½° Camber 1° Toe-in ⅛″

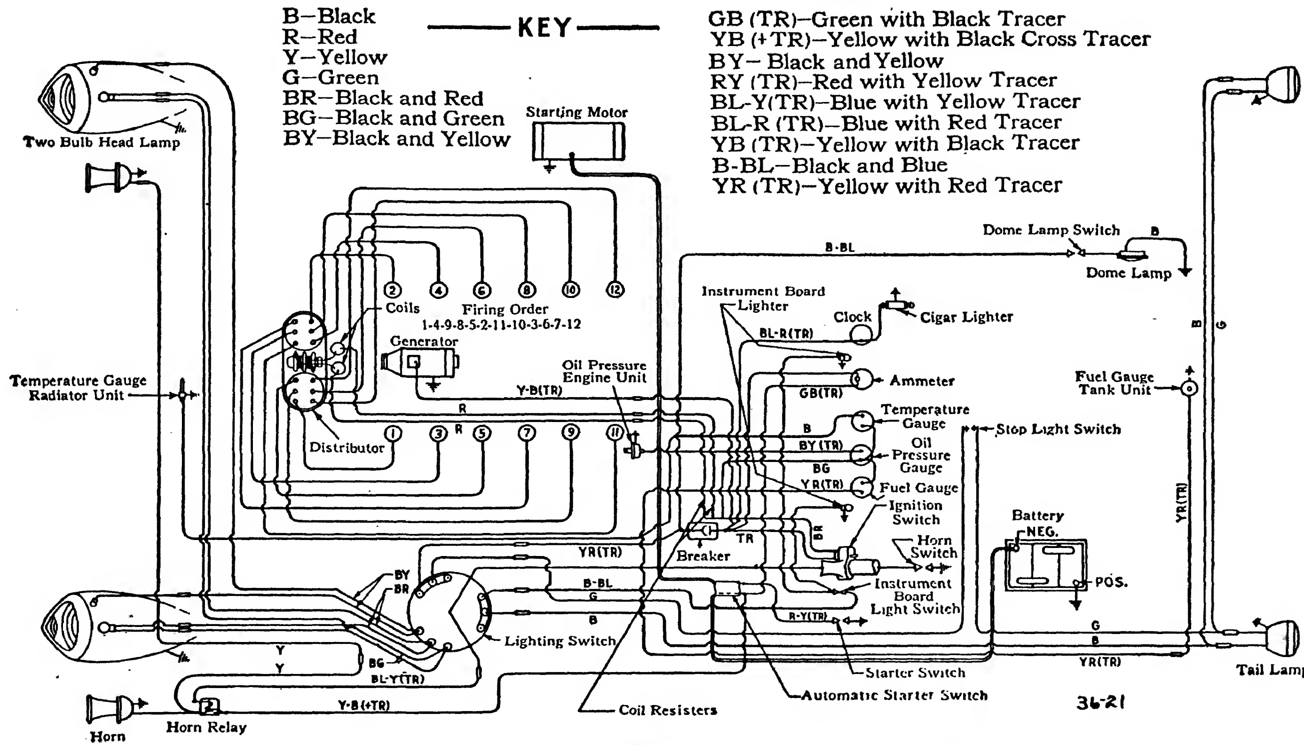
Cooling System—Pump **Type** Vane-Centrif. **Capacity** 32 Qts.

Clutch Long **Facings** Woven 9″ x 12″ x .137″ 2 Required

Gear Ratio 4.58 to 1

Axle Full-Floating

Brakes Mechanical
Front 33½″ x 2½″ x ¼″ Clearance .010″
Rear 33½″ x 2½″ x ¼″ Clearance .010″
Hand All Four Wheels
Lining Moulded Diagram 36-20



LINCOLN-ZEPHYR WIRING DIAGRAM, 1936, MODEL, 12-CYLINDER
Courtesy of Ford Motor Company

Lincoln-Zephyr **Model 12-Cylinder** **Year 1936**

Battery Ford **Type** **Volts** 6 **Amps.** 96
Frame Connection Positive

Lighting Double Filament **Head Lights** 6-8, 32-32 C.P.
Stop Light **Tail**
Parking Lights

Starter and Generator Ford

Generator Ford **Max. Chg. Rate** 18 Amps. **Speed** 10 M.P.H.
Regulation 3rd Brush **Cut-in** 7 Volts
Relay Air Gap **Contact Gap**

Ignition Ford **Contact Breaker Gap** .014″-.016″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-4-9-8-5-2-11-10-3-6-7-12
Timing Initial Advance 4° Crankshaft

Engine **Bore** 2.75″ **Stroke** 3.75″ **Taxable H.P.** 36.3
Piston Ring—Width Oil 1—.1545″-.155″ Comp. 2—.093″-.0935″
Diam. 2.75″ **Gap** Oil .008″-.013″ Comp. .008″-.013″
Oiling—Type Pressure **Capacity** 6 Qts.

Valves **Intake Timing—Open** 19°30′ B.T.C. **Close** 54°30′ A.B.C.
Intake Clearance .0125″-.0135″
Exhaust Timing—Open 57°30′ B.B.C. **Close** 16°30′ A.T.C.
Exhaust Clearance .0125″-.0135″

Carburetor Stromberg EE1

Steering

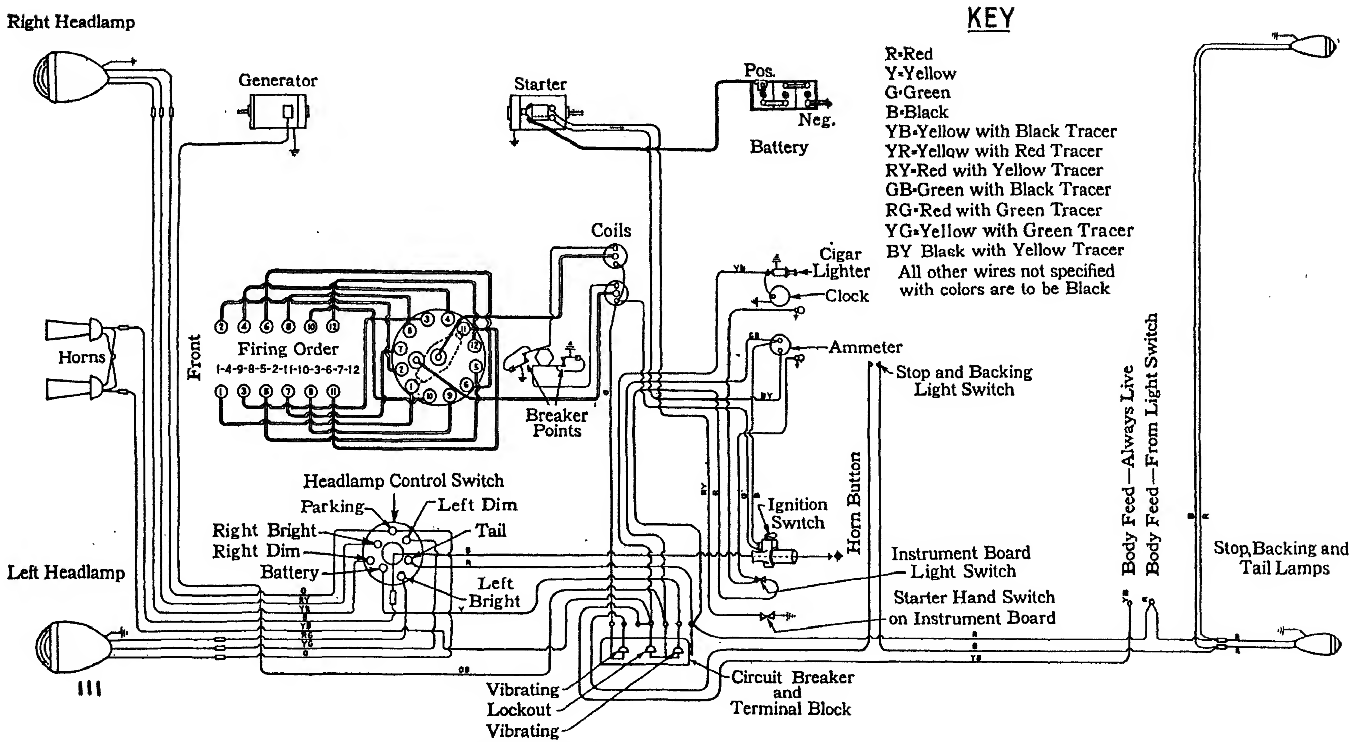
Cooling System Circulation **Type** Pump **Capacity** 27 Qts.

Clutch Long **Facings** Moulded 6″ x 10″ x .140″ 2 Required

Gear Ratio 4.33 to 1 Spiral Bevel

Axle Own ¾-Floating

Brakes Four-Wheel Mechanical **Front** 23.9″ x 1.75″ x .21″
Rear 23.9″ x 1.75″ x .21″
Hand All Four Wheels
Lining Moulded Diagram 36-21



LINCOLN WIRING DIAGRAM, 1935, MODEL V-12
Courtesy of Ford Motor Company

Lincoln **Model V-12** **Year 1935**

Battery Exide **Type** X-21-L **Volts** 6 **Amps.** 147

Frame Connection Negative

Lighting **Head Lights** 6-8, 32-21 C.P.

Dash and Tail

Side Lights 6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 15 Amps. **Speed** 20 M.P.H.

Regulation 3rd Brush **Cut-in** 7.5 Volts

Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .020″

Spark Plug—Size 18 M.M. **Gap** .022″

Firing Order 1-4-9-8-5-2-11-10-3-6-7-12

Timing 7° B.T.C. Retard

Engine **Bore** 3⅛″ **Stroke** 4½″ **Taxable H.P.** 46.8

Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″

Diam. 3⅛″ **Gap** .013″ on All

Oiling—Type Pump **Capacity** 12 Qts.

Valves **Intake Timing—Open** 21° B.T.C. **Close** 47° A.B.C.

Intake Clearance .003″ Cold

Exhaust Timing—Open 57° B.B.C. **Close** 11° A.T.C.

Exhaust Clearance .006″ Cold

Carburetor Stromberg EE22

Steering Caster 2° Camber 1° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 8 Gals.

Clutch Long **Facings** Moulded 7″ x 12″ x .137″ 2 Required

Gear Ratio Ring Gear 55 Pinion 12 Spiral Gears

Axle Timken Full-Floating

Brakes Mechanical Bendix

Front 34″ x 2½″ x ¼″ Clearance Heel .014″ Toe .008″

Rear 34″ x 2½″ x ¼″ Clearance Heel .014″ Toe .008″

Hand 4 Wheels

Lining Moulded and Woven

Diagram 111

Lincoln Models V-12-136 and V-12-145 Year 1934

Battery Exide **Type** LX-15-21L **Volts** 6 **Amps.** 148
Frame Connection Negative

Lighting Mazda 1116 **Head Lights** 6-8, 32-21 C.P.
Mazda 63, 87 **Dash, Tail and Stop** 6-8, 3-3-15 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator **Max. Chg. Rate** 21 Amps. **Speed** 1250 R.P.M.
Regulation 3rd Brush **Cut-in** 7-7.5 Volts
Relay Air Gap .010″-.030″ **Contact Gap** .025″-.035″

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 18 MM. **Gap** .022″
Firing Order 1-4-9-8-5-2-11-10-3-6-7-12 See Diagram
Timing 7° B.T.C.

Engine **Bore** 3⅛″ **Stroke** 4½″ **Taxable H.P.** 46.80
Piston Ring—Width Oil 2—5/32″ **Comp.** 3—⅛″
Diam. 3⅛″ **Gap** .013″ on All
***Oiling*—Type** Pump **Capacity** 11 Qts.

Valves **Intake Timing—Open** 21° B.T.C. **Close** 47° A.T.C.
Intake Clearance .003″
Exhaust Timing—Open 57° B.B.C. **Close** 11° A.T.C.
Exhaust Clearance .003″

Carburetor Stromberg

Steering Caster 2° Camber 1° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 8 Gals.

Clutch Long **Facings** Moulded 7″ x 12″ x .137″ 2 Required

Gear Ratio Ring Gear 55 Pinion 12 Spiral Gears

Axle Timken Full-Floating

Brakes Bendix Mechanical
- **Front** 34″ x 2½″ x ¼″ Clearance Heel .014″ Toe .008″
- **Rear** 34″ x 2½″ x ¼″ Clearance Heel .014″ Toe .008″
- **Hand** 4 Wheels

Lining Moulded and Woven

Lincoln **Model V-12-136** **Year 1933**

Battery Exide **Type** LX-15-21L **Volts** 6 **Amps.** 148
Frame Connection Negative

Lighting Double Contact · **Head Lights** 6-8, 32-32 C.P.
Single Contact **Dash, Tail and Stop** 6-8, 3-3-15 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 17.2 Amps. **Speed** 1400 R.P.M.
Regulation 3rd Brush **Cut-in** 7-7.5 Volts
Relay Air Gap .010″-.030″ **Contact Gap** .025″-.035″

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size ⅞″—18 S.A.E. **Gap** .025″-.030
Firing Order 1-4-9-8-5-2-11-10-3-6-7-12
Timing 7° Flywheel B.T.C. Full Advance

Engine **Bore** 3¼″ **Stroke** 4½″ **Taxable H.P.** 50.70
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3¼″ **Gap** .008″ on All

Oiling—Type Pump **Capacity** 12 Qts.

Valves **Intake Timing—Open** 21° B.T.C. **Close** 47° A.B.C.
Intake Clearance .003″ Cold
Exhaust Timing—Open 57° B.B.C. **Close** 11° A.T.C.
Exhaust Clearance .005″ Cold

Carburetor Stromberg

Steering Caster 2° Camber 1° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 8½ Gals.

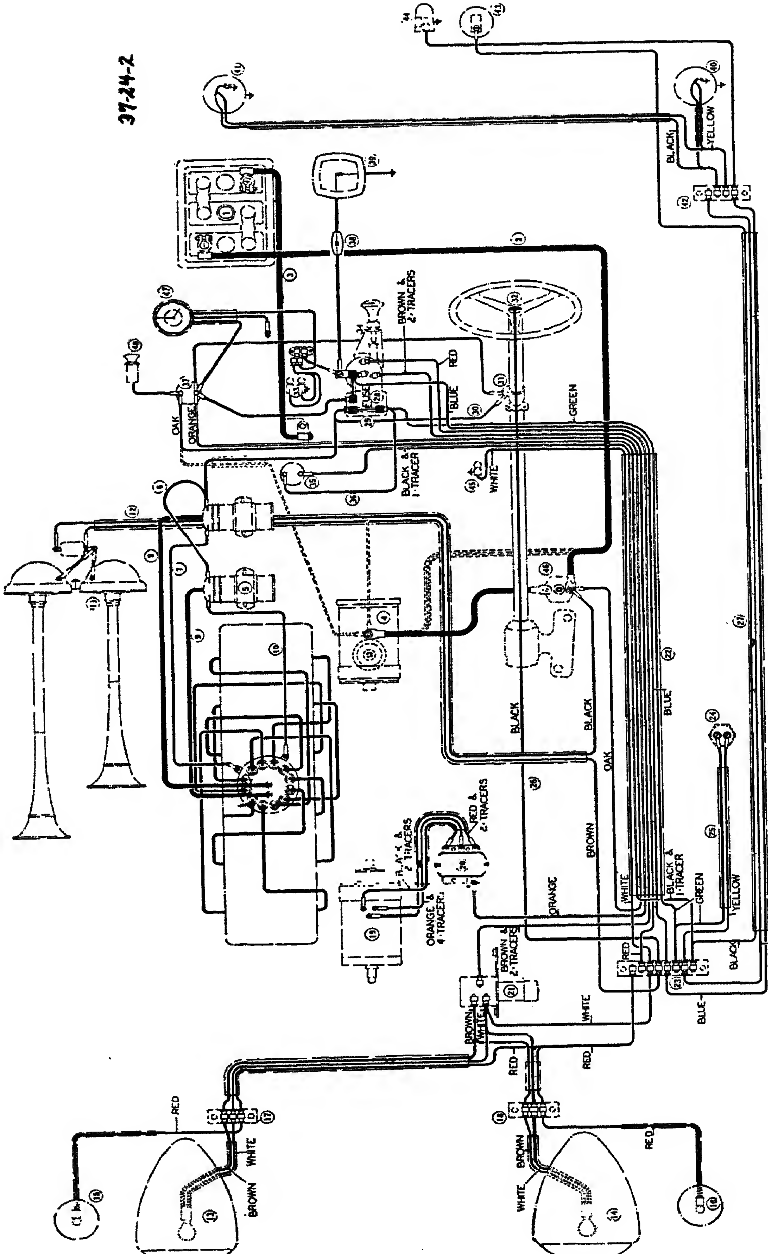
Clutch Long **Facing** Woven 6¼″ x 9¾″ x .137″ 4 Required

Gear Ratio Ring Gear 55 Pinion 12 Spiral Gears

Axle Timken Full-Floating

Brakes Bendix Booster Mechanical
Front 34″ x 2½″ x ¼″ Clearance Heel .008″ Toe .014″
Rear 34″ x 2½″ x ¼″ Clearance Heel .008″ Toe .014″
Hand 4 Wheels

Lining Moulded and Woven



NASH AMBASSADOR WIRING DIAGRAM, 1937, 6-CYLINDER
Courtesy of Nash Motors Company

Nash Ambassador **Model 6-Cylinder** **Year 1937**

Battery U.S.L. **Type** **Volts** 6-8 **Amps.** 100
Frame Connection Positive

Lighting **Head Lights** 6-8, 32-32 C.P.
Double Contact **Stop Light** 6-8, 3 C.P. **Tail** 6-8, 21 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 18 Amps. Hot **Speed** 2800 R.P.M., Arm.
Regulation **Cut-in** 7 Volts, 775 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 15° B.T.C.

Engine **Bore** 3⅜″ **Stroke** 4⅜″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 2- ⅛″, 3/16″ Comp. 2—⅛″
Diam. 3⅜″ **Gap** Oil .010″ Comp. .010″
Oiling—Type Gear Pump **Capacity** 7 Qts. **Pressure** 30 Lbs. @ 20 M.P.H.

Valves **Intake Timing—Open** 13½° A.T.C. **Close** 36½° A.B.C.
Intake Clearance Hot .008″ Operating, .008″ Timing
Exhaust Timing—Open 47½° B.B.C. **Close** 7½° A.T.C.
Exhaust Clearance Hot .015″ Operating, .015″ Timing

Carburetor Stromberg EX2

Steering Caster 2½° Camber 1½° Toe-in ⅛″

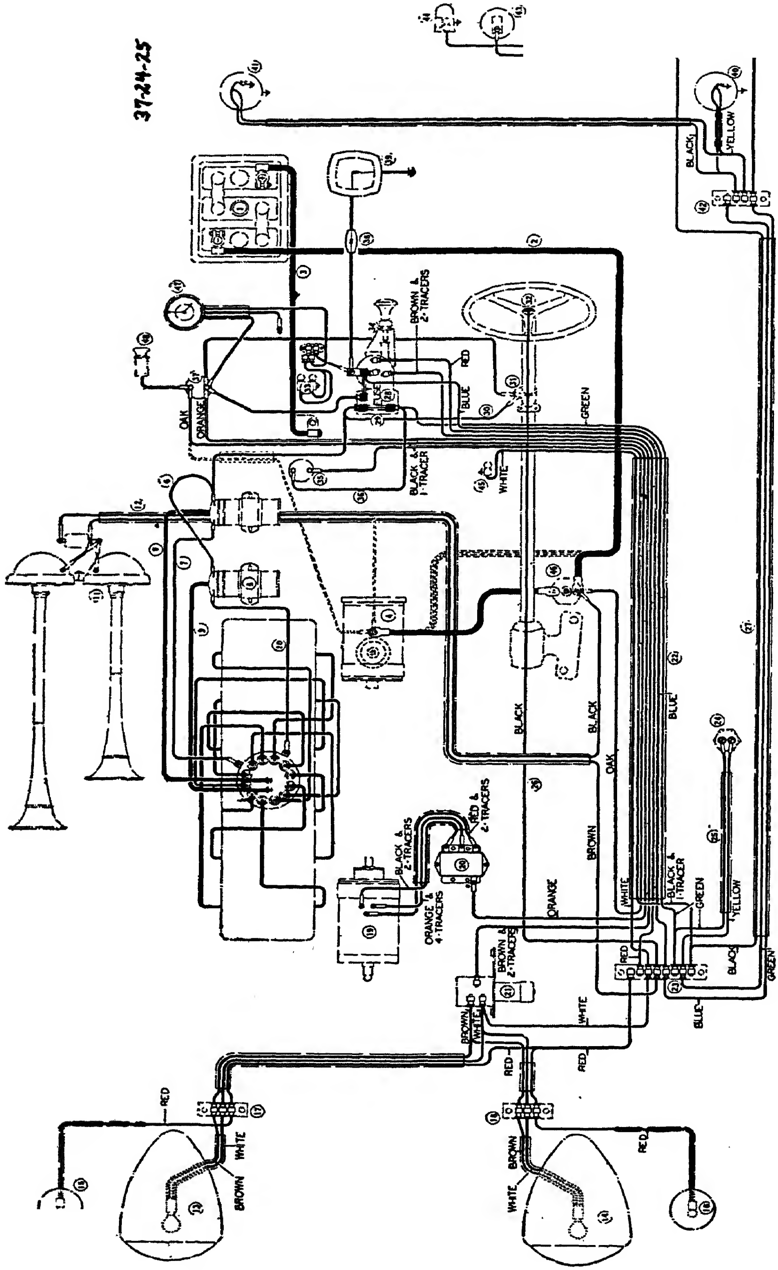
Cooling System Centrifugal **Type** Pump, Belt **Capacity** 17 Qts.

Clutch Borg & Beck **Facings** Woven 6″ x 10″ x ⅛″ 2 Required

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 2211/16″ x 2″ x 3/16″ Clearance .010″
Rear 2211/16″ x 2″ x 3/16″ Clearance .010″
Hand Rear Service
Lining Moulded Diagram 37-24



NASH AMBASSADOR WIRING DIAGRAM, 1937, 8-CYLINDER

Courtesy of Nash Motors Company

Nash Ambassador **Model 8-Cylinder** **Year 1937**

Battery U.S.L. **Type** **Volts** 6-8 **Amps.** 116
Frame Connection Positive

Lighting **Head Lights** 6-8, 32-32 C.P.
Double Contact **Stop Light** 6-8, 3 C.P. **Tail** 6-8, 21 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 28 Amps. Hot **Speed** 1800 R.P.M., Arm.
Regulation Voltage and Current **Cut-in** 7 Volts, 850 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .013″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing 15° B.T.C.

Engine **Bore** 3⅛″ **Stroke** 4¼″ **Taxable H.P.** 33.80
Piston Ring—Width Oil 2—⅛″, $\frac{3}{16}$″ Comp. 2—⅛″
Diam. 3⅛″ **Gap** Oil .010″ Comp. .010″
Oiling—Type Gear Pump **Capacity** 7 Qts.
Pressure 30 Lbs. @ 20 M.P.H.

Valves **Intake Timing—Open** 15° A.T.C. **Close** 38° A.B.C.
Intake Clearance Hot .008″ Operating, .008″ Timing
Exhaust Timing—Open 45° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance Hot .015″ Operating, .015″ Timing

Carburetor Stromberg EE7

Steering Caster 2° Camber 1½° Toe-in ⅛″

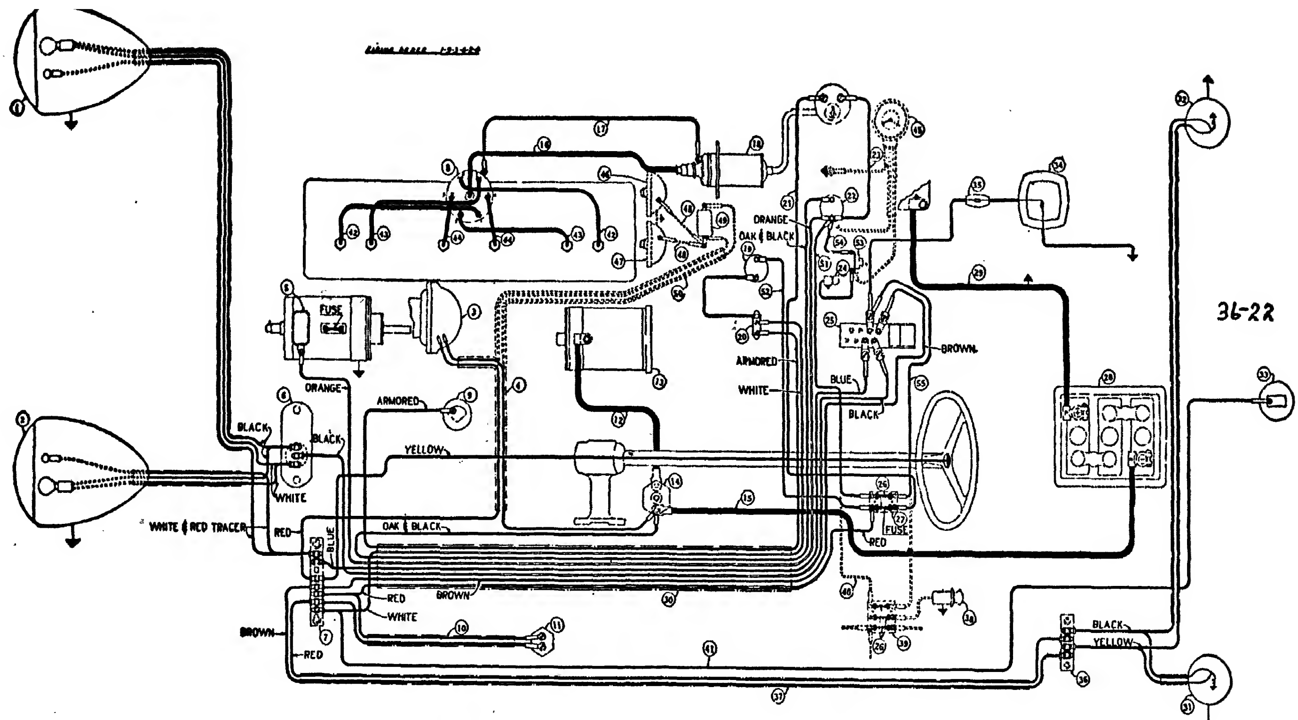
Cooling System Centrifugal **Type** Pump, Belt **Capacity** 21 Qts.

Clutch Borg & Beck **Facings** Woven 6″ x 10″ x ⅛″ 2 Required

Gear Ratio Ring Gear 41 Pinion 10 Spiral Gears

Axle Own Semi-Floating

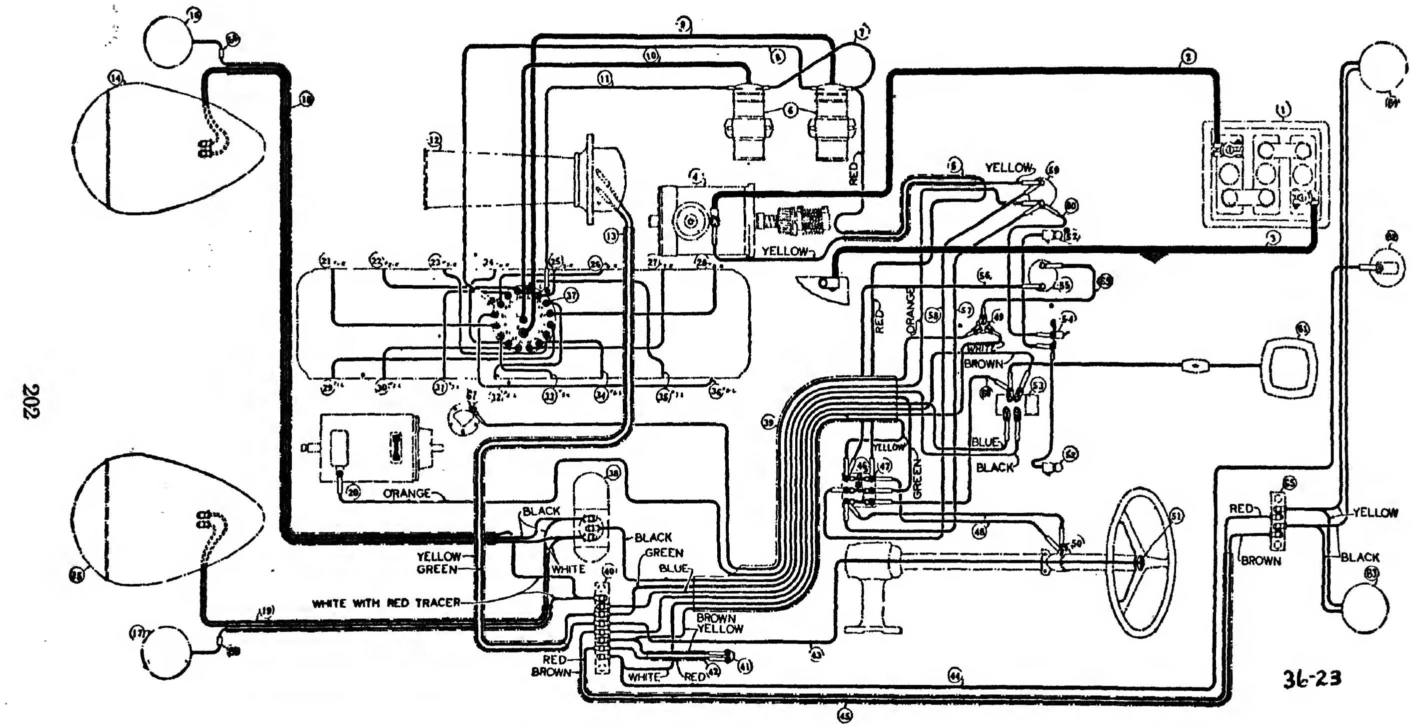
Brakes Bendix Hydraulic
Front 24″ x 2¼″ x $\frac{3}{16}$″ Clearance .010″
Rear 24″ x 2¼″ x $\frac{3}{16}$″ Clearance .010″
Hand Rear Service
Lining Moulded Diagram 37-25



NASH WIRING DIAGRAM, 1936, SERIES 3640A

Courtesy of Nash Motors Company

Nash	**Model Series 3640A**		**Year 1936**	
Battery	U.S.L.	**Type**	**Volts** 6	**Amps.** 120
		Frame Connection Negative		
Lighting	Pre-Focused Flange Type	**Head Lights** 6-8, 32-21 C.P.		
		Stop Light 6-8, 21 C.P.		**Tail** 6-8, 3 C.P.
		Parking Lights 6-8, 3 C.P.		
Starter and Generator	Auto-Lite			
Generator Auto-Lite		**Max. Chg. Rate** 14 Amps. Hot		**Speed**
		Regulation		**Cut-in**
		Relay Air Gap		**Contact Gap**
Ignition Auto-Lite		**Contact Breaker Gap** .020″		
		Spark Plug—Size 14 M.M.		**Gap** .025″
		Firing Order 1-5-3-6-2-4		
		Timing 15° B.T.C. Retard		
Engine	**Bore** $3\frac{3}{8}$″	**Stroke** $4\frac{3}{8}$″	**Taxable H.P.** 27.34	
	Piston Ring—Width Oil Control $\frac{1}{8}$″ and $\frac{3}{16}$″		**Comp.** $\frac{1}{8}$″	
	Diam. $3\frac{3}{8}$″		**Gap** .010″-.025″	
	Oiling—Type Pump		**Capacity** 5 Qts.	
Valves	**Intake Timing—Open** 13.5° A.T.C.		**Close** 36.5° A.B.C.	
	Intake Clearance .015″			
	Exhaust Timing—Open 47.5° B.B.C.		**Close** 7.5° A.T.C.	
	Exhaust Clearance .015″			
Carburetor	Stromberg EX2			
Steering	**Caster** 2°	**Camber** 0°-$1\frac{1}{2}$°	**Toe-in** $\frac{1}{8}$″	
Cooling System Pump		**Type** Centrifugal	**Capacity** 18 Qts.	
Clutch	Borg & Beck	**Facings** Moulded $6\frac{1}{8}$″ x $9\frac{7}{8}$″ x $\frac{1}{8}$″	2 Required	
Gear Ratio	4.4 to 1	Spiral Gears		
Axle	Own	Semi-Floating		
Brakes Bendix Hydraulic	**Front** $2\frac{13}{16}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″		**Clearance** .010″	
	Rear $2\frac{13}{16}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″		**Clearance** .010″	
	Hand Rear Wheels			
	Lining Moulded			**Diagram** 36-22



NASH AMBASSADOR WIRING DIAGRAM, 1936, SERIES 3600

Courtesy of Nash Motors Company

Nash Ambassador	Model Series 3600	Year 1936

Battery U.S.L. **Type** **Volts** 6 **Amps.** 133
Frame Connection Positive

Lighting
Head Lights 6-8, 32-21 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 14 Amps. Hot **Speed**
Regulation **Cut-in**
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing 15° B.T.C. Retard

Engine **Bore** 3⅛″ **Stroke** 4¼″ **Taxable H.P.** 31.25
Piston Ring—Width Oil 3/16″ **Comp.** ⅛″
Diam. 3⅛″ **Gap** .007″
Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** 15° A.T.C. **Close** 38° A.B.C.
Intake Clearance .015″
Exhaust Timing—Open 45° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .015″

Carburetor Stromberg EE22

Steering Caster 2½° Camber 1½° Toe-in ⅛″

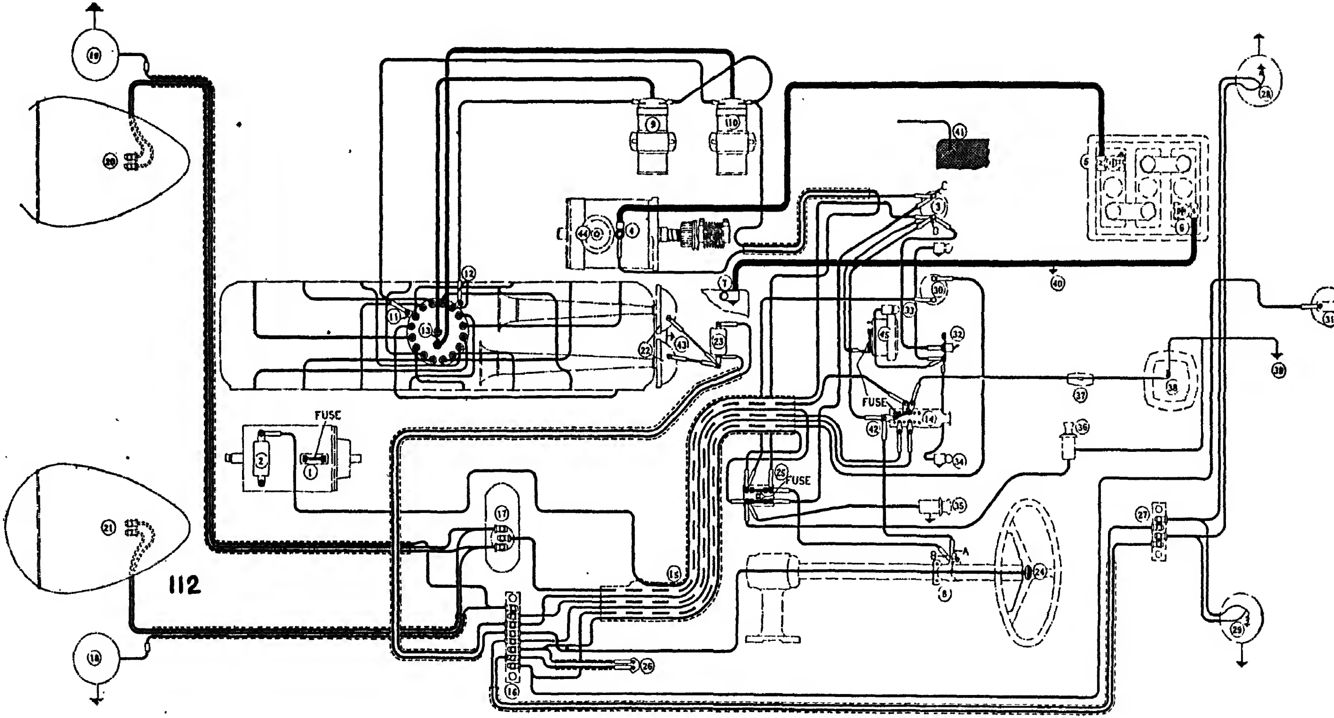
Cooling System Pump **Type** Centrifugal **Capacity** 21 Qts.

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio 4.1 to 1

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 2 13/16″ x 2¼″ x 3/16″ **Clearance** .010″
Rear 2 13/16″ x 2¼″ x 3/16″ **Clearance** .010″
Hand Rear Wheels
Lining Moulded Diagram 36-23



NASH WIRING DIAGRAM, 1935, SERIES 3580 AND 3520
Courtesy of Nash Motors Company

Nash Model Series 3580 and 3520 Year 1935

Battery U.S.L. **Type** 3580, KW-15A; 3520, KW-13A **Volts** 3580, 6; 3520, 6 **Amps.** 3580, 133; 3520, 115

Frame Connection Positive

Lighting

Double Contact	**Head Lights**	6-8, 21-32 C.P.
Single Contact	**Dash, Tail and Stop**	6-8, 3-21 C.P.
Single Contact	**Side Lights**	6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 17 Amps.

Regulation 3rd Brush **Cut-in** 7 Volts

Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .020″

Spark Plug—Size 14 M.M. **Gap** .025″

Firing Order 3580, 1-6-2-5-8-3-7-4; 3520, 1-5-3-6-2-4

Timing "IGN" Mark on Front Vibration Damper under Pointer

Engine **Bore** 3580, 3⅛″; 3520, 3⅜″ **Stroke** 3580, 4¼″; 3520, 4⅜″ **Taxable H.P.** 3580, 31.25; 3520, 27.34

Piston Ring—Width Oil 2 Comp. 2—⅛″ **Diam.** As Bore **Gap** .014″ on All

Oiling—Type Pump **Capacity** 3580, 8 Qts.; 3520, 7 Qts.

Valves **Intake Timing—Open** **Close**

Intake Clearance .015″ Hot

Exhaust Timing—Open **Close**

Exhaust Clearance .015″ Hot

Carburetor Stromberg 3580, EE22; 3520, EX32

Steering Caster 1° Camber 1½° Toe-in 0″-⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 3580, 21 Qts.; 3520, 17½ Qts.

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 3580, 44; 3520, 40 Pinion 3580, 10; 3520, 9 Spiral Gears

Axle Own Semi-Floating

Brakes Hydraulic Bendix

Front 3580, 23 13/32″ x 2¼″ x 5/32″ Clearance .010″
3520, 23 13/16″ x 1¾″ x 5/32″ Clearance .010″

Rear As on Front

Hand Rear Service

Lining Moulded

Diagram 112

Nash Model Big 6, Series 1220 Year 1934

Battery U.S.L. **Type** KW-13A **Volts** 6 **Amps.** 96
Frame Connection Positive

Lighting Mazda 1116 **Head Lights** 6-8, 32-21 C.P.
Mazda 63, 1158 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Cold **Max. Chg. Rate** 20 Amps. **Speed** 2300 R.P.M.
Regulation 3rd Brush **Cut-in** 7.0-7.5 Volts
Relay Air Gap .010″-.030″ **Contact Gap** .025″-.035″

gnition **Contact Breaker Gap** .020″
Spark Plug—Size 14 MM. **Gap** .022″
Firing Order 1-5-3-6-2-4
Timing "IGN" on Vibration Damper to Pointer on Case

Engine **Bore** 3⅜″ **Stroke** 4⅜″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 1—⅛″, 1—3/16″ Comp. 2—⅛″
Diam. 3⅜″ **Gap** .010″ on All
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** **Close**
Intake Clearance .015″ Hot
Exhaust Timing—Open **Close**
Exhaust Clearance .015″ Hot

Carburetor Stromberg EX32

Steering Caster 2½° Camber 1½° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 40 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Mechanical
- **Front** 23¾″ x 1¾″
- **Rear** 23¾″ x 1¾″
- **Hand** 4 Wheels

Lining Moulded

Nash Model 8, Series 1280 Year 1934

Battery U.S.L. **Type** KW-15A **Volts** 6 **Amps** 115
Frame Connection Positive

Lighting Mazda 1116 **Head Lights** 6-8, 32-21 C.P.
Mazda 63, 1158 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Cold **Max. Chg. Rate** 20 Amps. **Speed** 2300 R.P.M.
Regulation 3rd Brush **Cut-in** 7.0-7.5 Volts
Relay Air Gap .010″-.030″ **Contact Gap** .025″-.035″

Ignition **Contact Breaker Gap** .013″-.017″
Spark Plug—Size 14 MM. **Gap** .022″
Firing Order 1-6-2-5-8-3-7-4
Timing "IGN" on Vibration Damper to Pointer on Case

Engine **Bore** 3⅛″ **Stroke** 4¼″ **Taxable H.P.** 31.25
Piston Ring—Width Oil 1—⅛″, 1—$\frac{3}{16}$″ Comp. 2—⅛″
Diam. 3⅛″ **Gap** .010″ on All
Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** **Close**
Intake Clearance .015″ Hot
Exhaust Timing—Open **Close**
Exhaust Clearance .015″ Hot

Carburetor Stromberg EE22

Steering Caster 1½° Camber 1½° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 4⅜ Gals.

Clutch Borg & Beck **Facing** Moulded 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 41 Pinion 10 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Mechanical **Front** 23⅛″ x 2¼″
Rear 23⅛″ x 2¼″
Hand 4 Wheels
Lining Moulded

Nash **Model Big 6-1120** **Year 1933**

Battery U.S.L. **Type** KW-13A **Volts** 6 **Amps.** 96
Frame Connection Negative

Lighting Double Contact **Head Lights** 6-8, 21-21 C.P.
Double Contact **Stop & Tail** 6-8, 21-2 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator **Max. Chg. Rate** 17 Amps. **Speed** 1700 R.P.M.
Regulation 3rd Brush **Cut-in** 7.0-7.5 Volts
Relay Air Gap .010″-.030″ **Contact Gap** .025″-.035″

Ignition **Contact Breaker Gap** .018″-.020″
Spark Plug Size 18 M.M. **Gap** .022″
Firing Order—1-5-3-6-2-4
Timing 5° B.T.D.C.

Engine **Bore** 3-1/4″ **Stroke** 4-3/8″ **Taxable H.P.** 25.35
Piston Ring—Width 1-1/8″, 1-3/16″ 2-1/8″ **Diam.** 3-1/4″ **Gap**
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 5° A.T.C. **Close** 45° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Stromberg

Cooling System Centrifugal **Type** Pump **Capacity** 4-3/4 Gals.

Clutch Borg & Beck **Facing**—Moulded 9-7/8 x — x 1/8″

Gear Ratio Ring Gear 47 Pinion 10 Spiral Gears

Axle Own Semi-Floating

Brakes **Front** Clearance .015″
Midland
Mechanical **Rear**
Hand All 4 Wheels
Lining—Moulded

Nash **Model Standard 8-1130** **Year 1933**

Battery U.S.L. **Type** KW-13A **Volts** 6 **Amps.** 96
Frame Connection Negative

Lighting Double Contact **Head Lights** 6-8, 21-21 C.P.
Double Contact **Stop & Tail** 6-8, 21-2 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator **Max. Chg. Rate** 17 Amps. **Speed** 1700 R.P.M.
Regulation 3rd Brush **Cut-in** 7.0-7.5 Volts
Relay Air Gap .010″-.030″ **Contact Gap** .025″-.035″

Ignition **Contact Breaker Gap** .020″-.022″
Spark Plug—Size 18 M.M. **Gap** .022″
Firing Order—1-6-2-5-8-3-7-4
Timing 5° B.T.D.C.

Engine **Bore** 3″ **Stroke** 4-3/8″ **Taxable H.P.** 28.20
Piston Ring—Width 1-1/8″, 1-3/16″, 2-1/8″ **Diam.** 3″ **Gap**
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 5° A.T.C. **Close** 45° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Stromberg

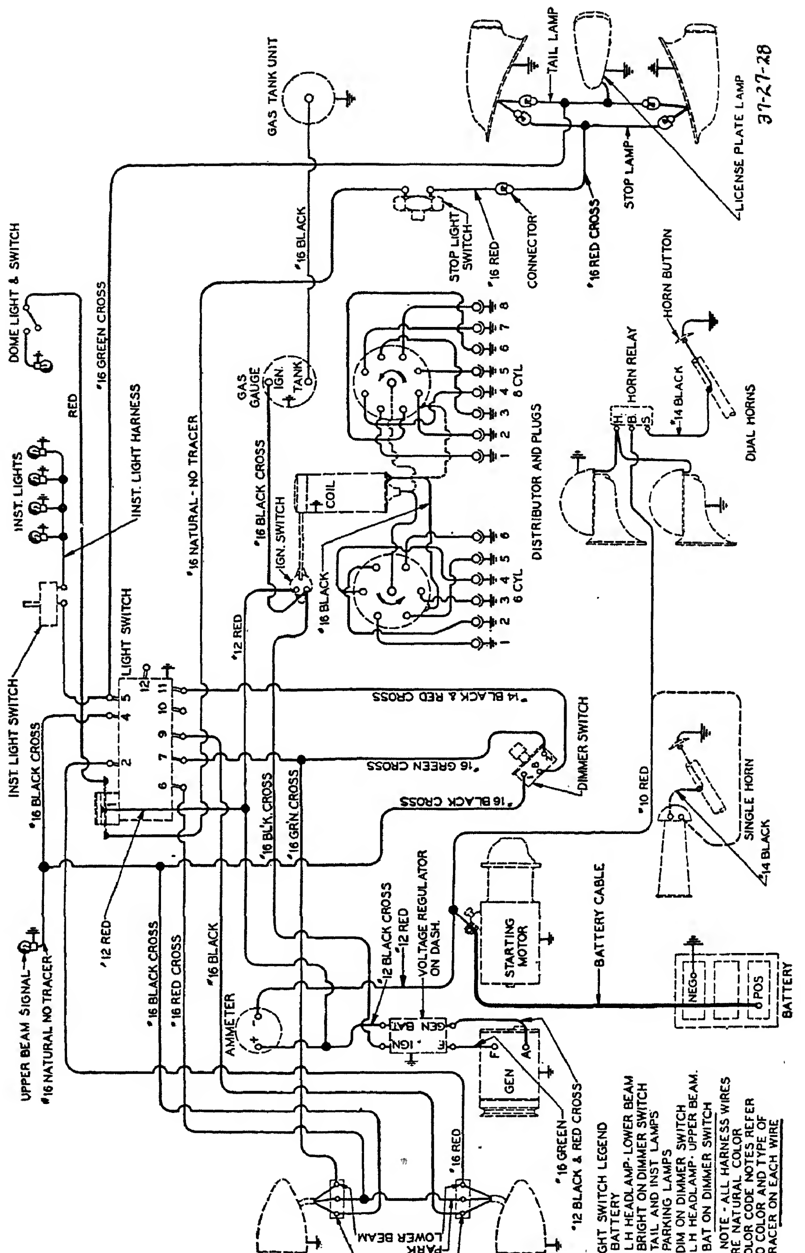
Cooling System Centrifugal **Type** Pump **Capacity** 4 Gals.

Clutch Borg & Beck **Facing**—Moulded 9-7/8″ x — x 1/8″

Gear Ratio Ring Gear 40 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Midland Mechanical **Front** * **Clearance** .015″
Rear
Hand All 4 Wheels
Lining—Moulded



OLDSMOBILE WIRING DIAGRAM, 1937, 6-CYLINDER

Courtesy of Olds Motor Works

Oldsmobile **Model 6-Cylinder** **Year 1937**

Battery	Delco-Remy	**Type**	**Volts** 6-8	**Amps.** 94
		Frame Connection Negative		
Lighting	T-2320	**Head Lights** 6-8, 21-32 C.P.		
	T-1154	**Stop Light** 6-8, 21 C.P.		**Tail** 6-8, 3 C.P.
	T-55	**Parking Lights** 6-8, 1½ C.P.		

Starter and Generator Delco-Remy

Generator Delco-Remy
- **Max. Chg. Rate** 18 Amps. Hot — **Speed** 3500 R.P.M., Arm.
- **Regulation** Voltage — **Cut-in** 6.5 Volts, 838 R.P.M.
- **Relay Air Gap** — **Contact Gap**

Ignition Delco-Remy
- **Contact Breaker Gap** .018″
- **Spark Plug—Size** 14 M.M. — **Gap** .030″
- **Firing Order** 1-5-3-6-2-4
- **Timing** T.D.C.

Engine **Bore** 3$\frac{7}{16}$″ **Stroke** 4⅛″ **Taxable H.P.** 28.40
- **Piston Ring—Width** Oil 2—$\frac{3}{16}$″ Comp. 2—⅛″
- **Diam.** 3$\frac{7}{16}$″ Gap Oil .007″ Comp. .007″
- **Oiling—Type** Gear Pump **Capacity** 6 Qts. **Pressure** 27 Lbs. Max.

Valves
- **Intake Timing—Open** 5° B.T.C. **Close** 45° A.B.C.
- **Intake Clearance** Hot .008″ Operating, .008″ Timing
- **Exhaust Timing—Open** 45° B.B.C. **Close** 5° A.T.C.
- **Exhaust Clearance** Hot .011″ Operating, .011″ Timing

Carburetor Carter 351S

Steering Caster ¼° Camber ⅛° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 16 Qts.

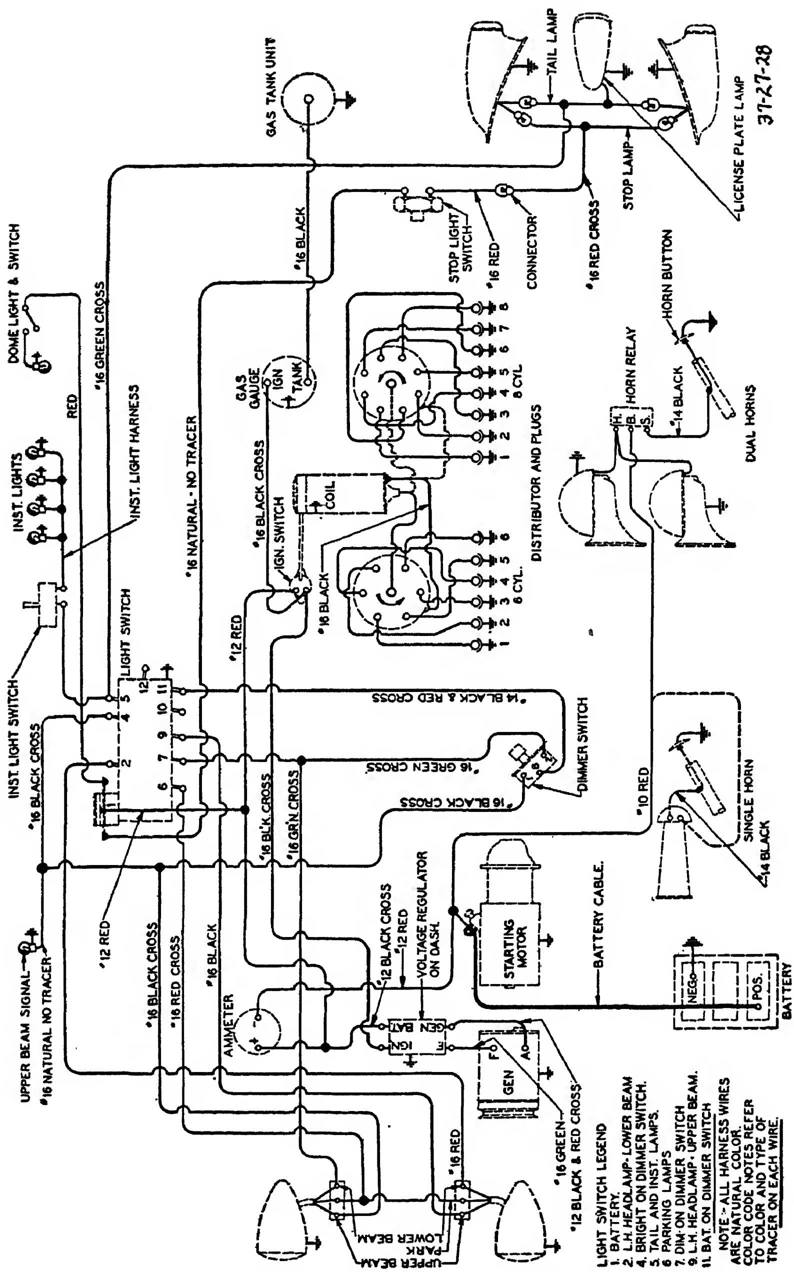
Clutch Borg & Beck **Facings** Woven 5⅝″ x 9¼″ x ⅛″ 2 Required

Gear Ratio Ring Gear 35 Pinion 8 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
- **Front** 21$\frac{5}{16}$″ x 1¾″ x $\frac{3}{16}$″ Clearance .010″
- **Rear** 21$\frac{5}{16}$″ x 1¾″ x $\frac{3}{16}$″ Clearance .010″
- **Hand** Rear Service
- **Lining** Moulded and Woven

Diagram 37-27



OLDSMOBILE WIRING DIAGRAM, 1937, 8-CYLINDER

Courtesy of Olds Motor Works

Oldsmobile — Model 8-Cylinder — Year 1937

Battery Delco-Remy **Type** **Volts** 6-8 **Amps.** 110
Frame Connection Negative

Lighting
T-2320 **Head Lights** 6-8, 21-32 C.P.
T-1154 **Stop Light** 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
T-55 **Parking Lights** 6-8, 1½ C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 18 Amps. Hot **Speed** 3500 R.P.M., Arm.
Regulation Voltage **Cut-in** 6.5 Volts, 800 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .013″
Spark Plug—Size 14 M.M. **Gap** .040″
Firing Order 1-6-2-5-8-3-7-4
Timing 2° B.T.C.

Engine **Bore** 3¼″ **Stroke** 3⅞″ **Taxable H.P.** 33.80
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3¼″ **Gap** Oil .007″ Comp. .009″
Oiling—Type Gear Pump **Capacity** 7 Qts. **Pressure** 27 Lbs. Max.

Valves **Intake Timing—Open** T.D.C. **Close** 35° A.B.C.
Intake Clearance Hot .008″ Operating, .008″ Timing
Exhaust Timing—Open 45° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance Hot .011″ Operating, .011″ Timing

Carburetor Carter 345S

Steering Caster ¼° Camber ⅛° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 20 Qts.

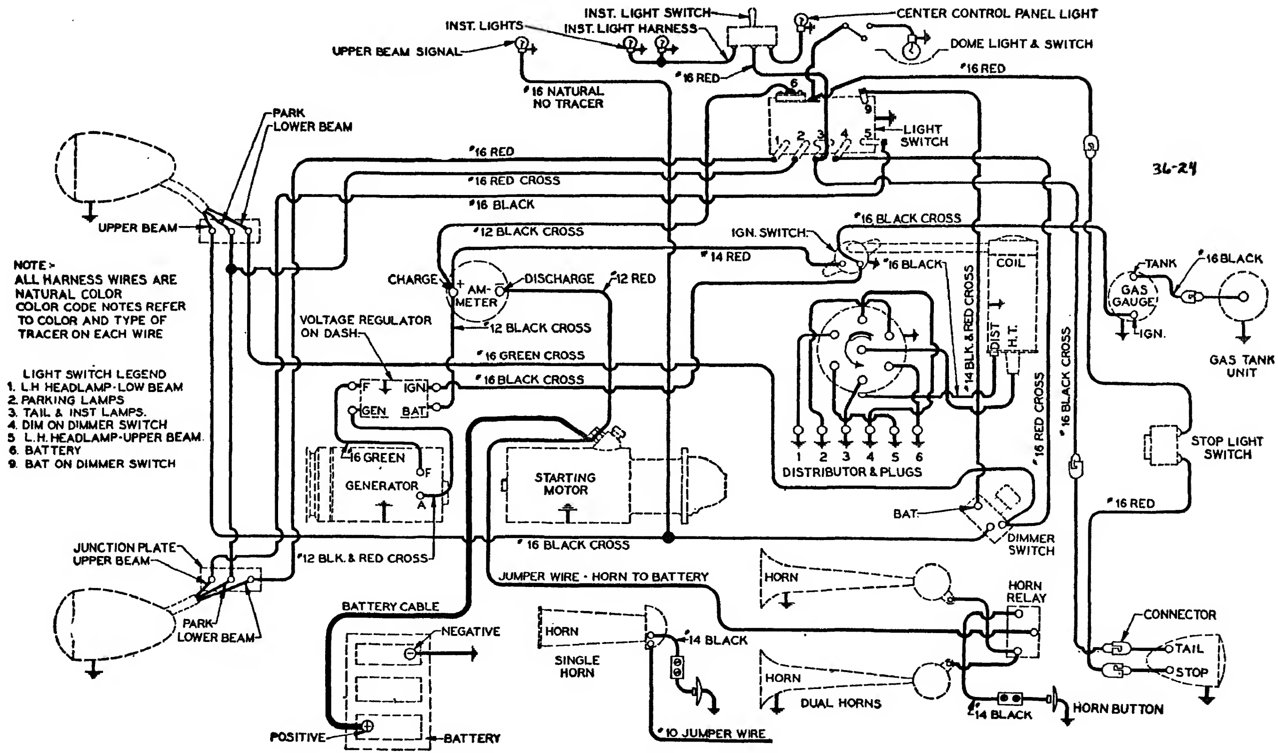
Clutch Borg & Beck **Facings** Woven 6″ x 10″ x ⅛″ 2 Required

Gear Ratio Ring Gear 35 Pinion 8 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 23″ x 1¾″ x 3/16″ Clearance .010″
Rear 23″ x 1¾″ x 3/16″ Clearance .010″
Hand Rear Service

Lining Moulded and Woven **Diagram** 37-28



OLDSMOBILE WIRING DIAGRAM, 1936, MODEL F-36

Courtesy of Olds Motor Works

Oldsmobile **Model F-36** **Year 1936**

Battery Delco **Type** 15-T **Volts** 6-8 **Amps.** 94
Frame Connection Negative

Lighting Mazda T-2320 L **Head Lights** 6-8, 32-21 C.P.
Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 21 Amps. Hot **Speed** 36 M.P.H.
Regulation 3rd Brush Non-Adjust. with Voltage Control **Cut-in** 6 Volts
Contact Gap .015″-.025″

Ignition Delco-Remy
Contact Breaker Gap .020″
Spark Plug—Size 18 M.M. **Gap** .030″-.033″
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Engine **Bore** 3$\frac{5}{16}$″ **Stroke** 4$\frac{1}{8}$″ **Taxable H.P.** 26.3
Piston Ring—Width Oil 2—.145″ Comp. 2—.148″
Diam. 3$\frac{5}{16}$″ **Gap** Oil .007″-.015″ Comp. .007″-.012″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 225° A.T.C.
Intake Clearance .008″ Warm
Exhaust Timing—Open 135° A.T.C. **Close** 5° A.T.C.
Exhaust Clearance .010″ Warm

Carburetor Carter W1

Steering Caster 1½° Camber ⅛° Toe-in ⅛″

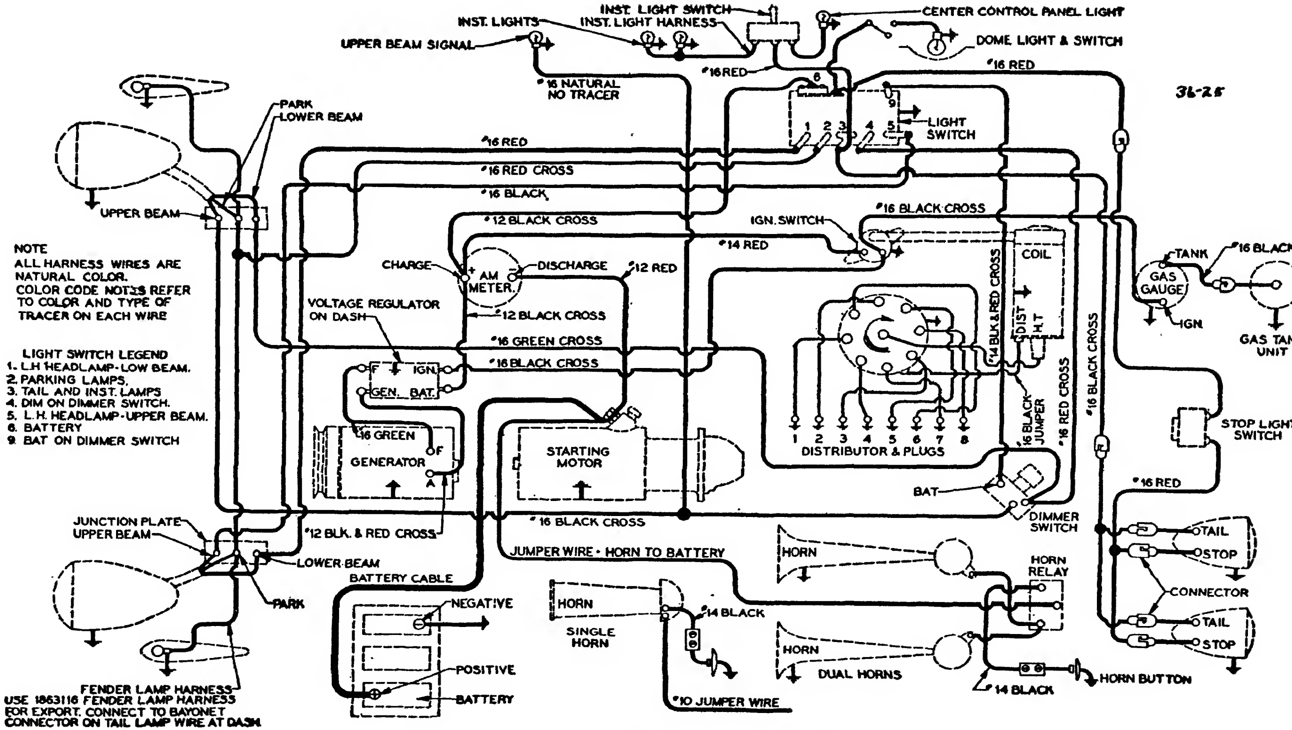
Cooling System Centrifugal **Type** Pump **Capacity** 12.5 Qts.

Clutch Borg & Beck **Facings** Woven 5⅝″ x 9″ x .133″ 2 Required

Gear Ratio 4.55 to 1 Spiral Gears

Axle Semi-Floating

Brakes Bendix Hydraulic
Front 23¾″ x 2″ x $\frac{3}{16}$″ Clearance .010″
Rear 23¾″ x 2″ x $\frac{3}{16}$″ Clearance .010″
Hand Rear Service
Lining Moulded and Woven Diagram 36-24



OLDSMOBILE WIRING DIAGRAM, 1936, MODEL L-36

Courtesy of Olds Motor Works

Oldsmobile **Model L-36** **Year 1936**

Battery Delco **Type** 17-K **Volts** 6-8 **Amps.** 110
Frame Connection Negative

Lighting Mazda T-2320-L **Head Lights** 6-8, 32-31 C.P.
Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 21 Amps. Hot **Speed** 38 M.P.H.
Regulation 3rd Brush Non-Adjust. with Voltage Control **Cut-in** 6 Volts
Contact Gap .015″-.025″

Ignition Delco-Remy
Contact Breaker Gap .015″
Spark Plug—Size 18 M.M. **Gap** .030″-.033″
Firing Order 1-6-2-5-8-3-7-4
Timing .002″ B.T.C. Piston Movement

Engine **Bore** 3″ **Stroke** 4¼″ **Taxable H.P.** 28.8
Piston Ring—Width Oil 2—.125″ Comp. 2—.138″
Diam. 3″ **Gap** Oil .007″-.015″ Comp. .007″-.012″
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 222° A.T.C.
Intake Clearance .008″ Warm
Exhaust Timing—Open 140° A.T.C. **Close** 10° A.T.C.
Exhaust Clearance .010″ Warm

Carburetor Carter WD-0

Steering Caster 1½° Camber ⅛° Toe-in ⅛″

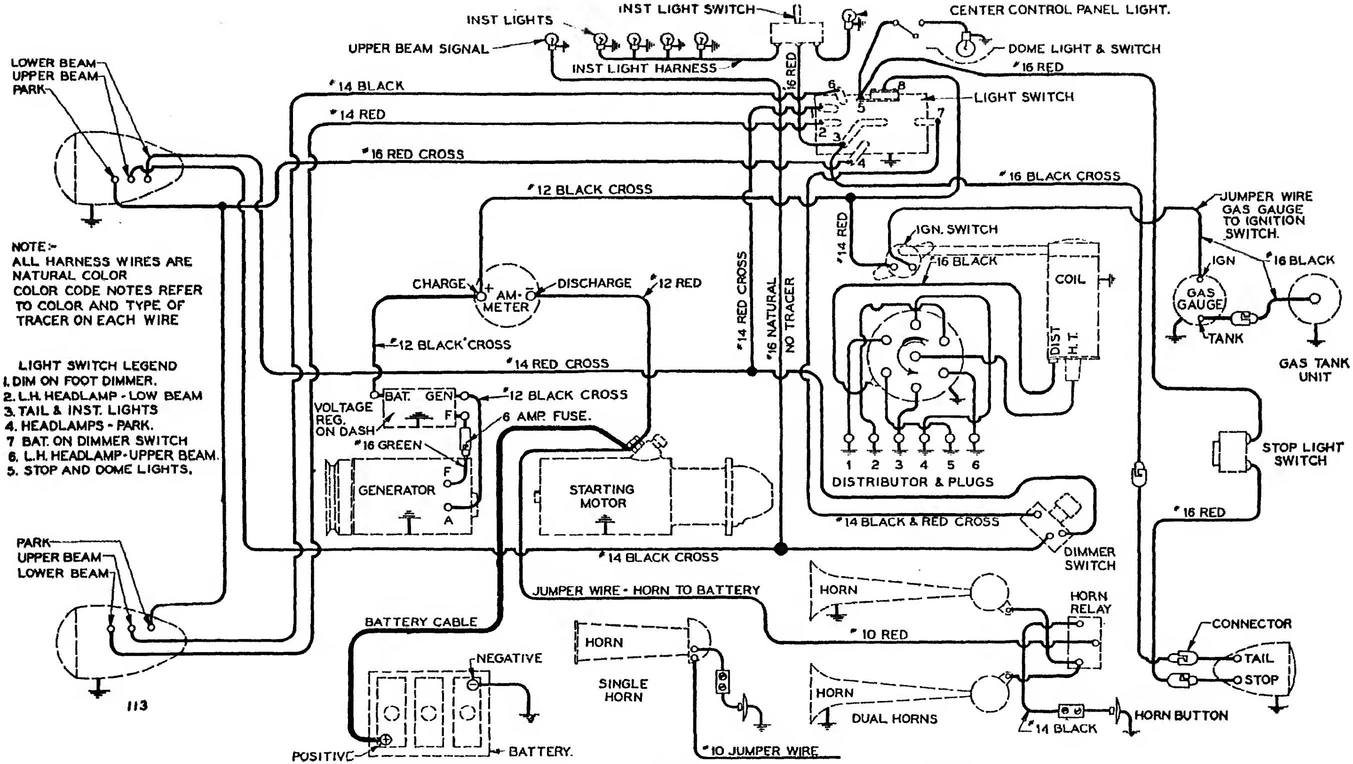
Cooling System Centrifugal **Type** Pump **Capacity** 16 Qts.

Clutch Borg & Beck **Facings** Woven 6⅛″ x 9⅞″ x .125″ 2 Required

Gear Ratio 4.55 to 1 Spiral Gears

Axle Semi-Floating

Brakes Bendix Hydraulic
Front 26″ x 2″ x 3/16″ Clearance .010″
Rear 26″ x 2″ x 3/16″ Clearance .010″
Hand Rear Service
Lining Moulded and Woven **Diagram** 36-25



OLDSMOBILE WIRING DIAGRAM, 1935, MODEL F-35, 6-CYLINDER

Courtesy of Olds Motor Works

Oldsmobile Model F35, 6-Cylinder Year 1935

Battery Delco-Remy **Type** 15T **Volts** 6 **Amps.** 100
Frame Connection Negative

Lighting Mazda 2320 **Head Lights** 6-8, 32-21 C.P.
Mazda 51, 63, 87 **Dash, Tail and Stop** 6-8, 1-3-15 C.P.
Mazda 55 **Side Lights** 6-8, 1½ C.P.

Starter and Generator Delco-Remy

Generator Cold **Max. Chg. Rate** 22 Amps. **Speed**
Regulation 3rd Brush **Cut-in** 6.7-7.5 Volts
Relay Air Gap **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .022″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 2° B.T.C. Retard

Engine **Bore** 3 5/16′ **Stroke** 4⅛″ **Taxable H.P.** 26.3
Piston Ring—Width Oil 1—3/16″ Comp. 2—⅛″
Diam. 3 5/16″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 225° A.T.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open .135° A.T.C. **Close** 5° A.T.C.
Exhaust Clearance .010″ Hot

Carburetor Stromberg EX22

Steering Caster 1½° Caster ⅛° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 13 Qts.

Clutch Borg & Beck **Facings** Woven 5⅝″ x 9″ x .133″ 2 Required

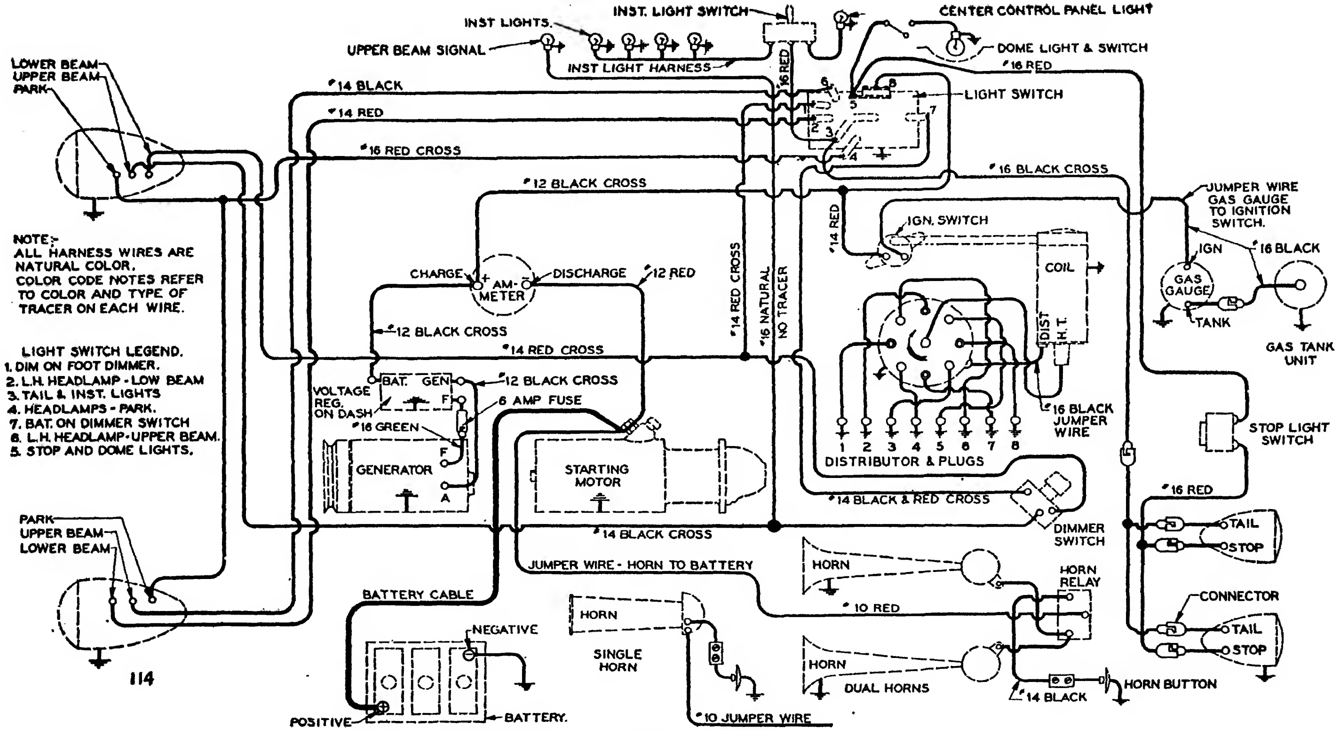
Gear Ratio Ring Gear 40 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Hydraulic Bendix
- **Front** 23¾″ x 2″ x 3/16″ Clearance Anchor .008″ Screw .010″
- **Rear** 23¾″ x 2″ x 3/16″ Clearance Anchor .008″ Screw .010″
- **Hand** Rear Service

Lining Moulded and Woven

Diagram 113



OLDSMOBILE WIRING DIAGRAM, 1935, MODEL L-35, 8-CYLINDER

Courtesy of Olds Motor Works

Oldsmobile Model L35, 8-Cylinder Year 1935

Battery Delco-Remy **Type** 17K **Volts** 6 **Amps.** 114
Frame Connection Negative

Lighting Mazda 2320-C **Head Lights** 6-8, 32-21 C.P.
Mazda 51, 63, 87 **Dash, Tail & Stop** 6-8, 1-3-15 C.P.
Mazda 55 **Side Lights** 6-8, 1½ C.P.

Starter and Generator Delco-Remy

Generator Cold **Max. Chg. Rate** 22 Amps. **Speed**
Regulation 3rd Brush **Cut-in** 6.7-7.5 Volts
Relay Air Gap **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .022″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing 3° B.T.C. Retard

Engine **Bore** 3″ **Stroke** 4¼″ **Taxable H.P.** 28.8
Piston Ring—Width Oil 1—⅛″, 1—3/16″ **Comp.** 2—⅛″
Diam. 3″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 222° A.T.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 140° A.T.C. **Close** 10° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Stromberg EE1

Steering Caster 1½° Camber ¼° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 16 Qts.

Clutch Borg & Beck **Facings** Woven 6⅛″ x 9⅞″ x .133″

Gear Ratio Ring Gear 40 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes · Hydraulic Bendix
Front 25 15/16″ x 2″ x 3/16″ Clearance Anchor .008″ Screw .010″
Rear 25 15/16″ x 2″ x 3/16″ Clearance Anchor .008″ Screw .010″
Hand Rear Service
Lining Moulded and Woven

Diagram 114

Oldsmobile Model F-34, 6-Cylinder Year 1934

Battery Delco **Type** 15-RW **Volts** 6 **Amps.** 94
Frame Connection Negative

Lighting
Mazda 2320-C **Head Lights** 6-8, 32-21 C.P.
Mazda 63 **Dash and Tail** 6-8, 3 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 13-15 Amps. **Speed** 3000 R.P.M.
Regulation 3rd Brush **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .022″
Spark Plug—Size 18 MM. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Engine **Bore** 3 5/16″ **Stroke** 4 1/8″ **Taxable H.P.** 26.3
Piston Ring—Width Oil 1—.1865″ Comp. 2—.124″
Diam. 3 5/16″ **Gap** .009″ on All
Oiling—Type **Capacity**

Valves **Intake Timing—Open** T.D.C. **Close** 50° A.B.C.
Intake Clearance .007″ Hot
Exhaust Timing—Open 40° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .009″ Hot

Carburetor Stromberg EX23

Steering Caster 3° Camber 1° Toe-in 3/

Cooling System Centrifugal **Type** Pump **Capacity** 3 3/4 Gals.

Clutch Borg & Beck **Facings** Moulded 5: x 9″ x 1/8″ 2 Required

Gear Ratio Ring Gear 41 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 23 3/4″ x 1 3/4″ x 5/32″ Clearance Heel .010″ Toe .008″
Rear 23 3/4″ x 1 3/4″ x 5/32″ Clearance Heel .010″ Toe .008″
Hand Rear Service

Lining Moulded

Oldsmobile Model L-34, 8-Cylinder Year 1934

Battery Delco **Type** 17-GW **Volts** 6 **Amps.** 107
Frame Connection Negative

Lighting Mazda 2320-C **Head Lights** 6-8, 32-21 C.P.
Mazda 63 **Dash and Tail** 6-8, 3 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 13-15 Amps. **Speed** 3000 R.P.M.
Regulation 3rd Brush **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .022″
Spark Plug—Size 18 MM. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing "IGN" on Vibration Damper to Pointer on Case

Engine **Bore** 3″ **Stroke** 4¼″ **Taxable H.P.** 28.8
Piston Ring—Width Oil 1—⅛″, 1—3/16″ Comp. 2—⅛″
Diam. 3″ **Gap** .007″
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 42° A.B.C.
Intake Clearance .007″ Hot
Exhaust Timing—Open 40° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .009″ Hot

Carburetor Stromberg EE1

Steering Caster 2° Camber 1° Toe-in 3/16″

Cooling System Centrifugal **Type** Pump **Capacity** 4¾ Gals.

Clutch Borg & Beck **Facings** Moulded 6⅛″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 43 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 25 29/32″ x 1¾″ x 3/16″ Clearance Heel .010″ Toe .008″
Rear 25 29/32″ x 1¾″ x 3/16″ Clearance Heel .010″ Toe .008″
Hand Rear Service
Lining Moulded

Oldsmobile Model F-33 Year 1933

Battery	Delco	**Type** 13-L-CU		**Volts** 6	**Amps.** 86	
		Frame Connection		Negative		

Lighting	Double Contact	**Head Lights**	6-8, 32-21 C.P.	
	Single Contact	**Dash & Tail**	6-8, 3-15 C.P.	**Stop** 15 C.P.
	Single Contact	**Side Lights**	6-8, 3 C.P.	

Starter and Generator Delco-Remy

Generator Hot
- **Max. Chg. Rate** 9-12 Amps. **Speed** 1800-2000 R.P.M.
- **Regulation** 3rd Brush, Thermo. **Cut-in** 6.75-7.5 Volts
- **Relay Air Gap** .012″-.017″ **Contact Gap** .015″-.025″

Ignition
- **Contact Breaker Gap** .018″-.024″
- **Spark Plug—Size** — 18 M.M. **Gap** .025″
- **Firing Order**—1-5-3-6-2-4
- **Timing** 3-1/2° B.T.D.C.

Engine **Bore** 3-3/8″ **Stroke** 4-1/8″ **Taxable H.P.** 27.34
- **Piston Ring—Width** 1-3/16″, 2-1/8″ **Diam.** 3-3/8″ **Gap** All Rings .007″
- **Oiling—Type** Pump **Capacity** 6 Qts.

Valves
- **Intake Timing—Open** At T.D.C. **Close** 50° A.B.C
- **Intake Clearance** .007″ Hot
- **Exhaust Timing—Open** 40° B.B.C. **Close** 10 A.T.C.
- **Exhaust Clearance** .009″ Hot

Carburetor Stromberg EC22

Cooling System Centrifugal **Type** Pump **Capacity** 4-1/4 Gals.

Clutch Borg & Beck **Facing**—Moulded 9-7/8″ x 6-1/8″ x 1/8″

Gear Ratio Ring Gear 41 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Mechanical	**Front**	25-29/32″ x 1-3/4″ x 3/16″	Clearance .010″
	Rear	25-29/32″ x 1-3/4″ x 3/16″	Clearance .010″
	Hand	All 4 Wheels	
	Lining—Moulded		

Oldsmobile **Model 8 Cylinder L-33** **Year 1933**

Battery Delco **Type** 13J-CU **Volts** 6 **Amps.** 98
Frame Connection Negative

Lighting Double Contact **Head Lights** 6-8, 32-21 C.P.
Single Contact **Dash & Tail** 6-8, 3-15 C.P. **Stop** 15 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 9-12 Amps. **Speed** 1800-2000 R.P.M.
Regulation 3rd Brush, Thermo. **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order—1-6-2-5-8-3-7-4
Timing 3-1/2° B.T.D.C.

Engine **Bore** 3-1/4″ **Stroke** 4-1/4″ **Taxable H. P.** 28.8
Piston Ring—Width 1-1/8″, 1-3/16″, 2-1/8″ **Diam.** 3-1/4″
Gap All Rings .007″
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** At T.D.C. **Close** 42° A.B.C.
Intake Clearance .007″ Hot
Exhaust Timing—Open 40° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .009″ Hot

Carburetor Stromberg EE22

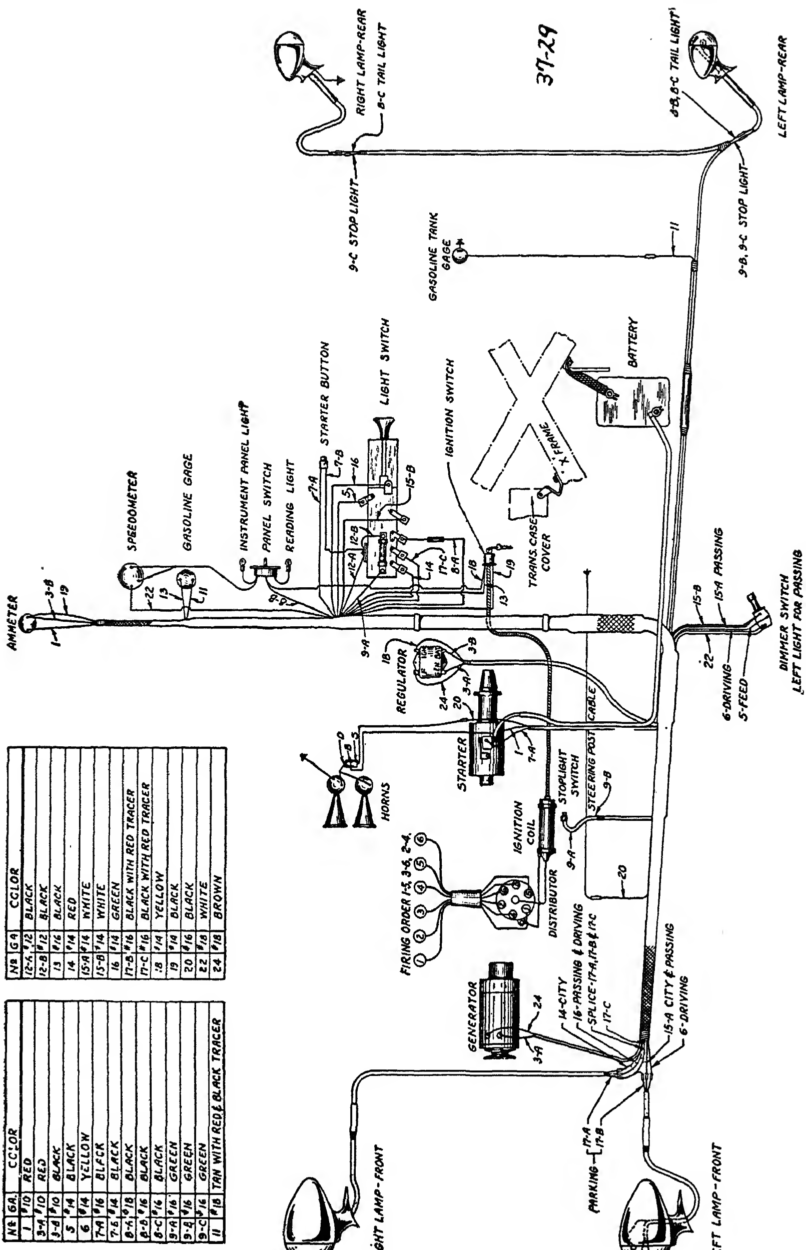
Cooling System Centrifugal **Type** Pump **Capacity** 4-1/4 Gals.

Clutch Borg & Beck **Facing**—Moulded 9-7/8″ x 6-1/8″ x 1/8″

Gear Ratio Ring Gear 41 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Mechanical { **Front** 25-29/32″ x 1/3-4″ x 3/16″ Clearance 010″
Rear 25-29/32″ x 1-3/4″ x 3/16″ Clearance .010″
Hand All 4 Wheels
Lining—Moulded



Nº	GA.	COLOR
1	#10	RED
3-A	#10	RED
3-B	#10	BLACK
5	#14	BLACK
6	#14	YELLOW
7-A	#16	BLACK
7-B	#14	BLACK
8-A	#18	BLACK
8-B	#16	BLACK
8-C	#16	BLACK
9-A	#16	GREEN
9-B	#16	GREEN
9-C	#16	GREEN
11	#18	TAN WITH RED & BLACK TRACER

Nº	GA	COLOR
12-A	#12	BLACK
12-B	#12	BLACK
13	#16	BLACK
14	#14	RED
15-A	#14	WHITE
15-B	#14	WHITE
16	#14	GREEN
17-B	#16	BLACK WITH RED TRACER
17-C	#16	BLACK WITH RED TRACER
18	#14	YELLOW
19	#14	BLACK
20	#16	BLACK
22	#18	WHITE
24	#18	BROWN

PACKARD WIRING DIAGRAM, 1937, 6-CYLINDER

Courtesy of Packard Motor Car Company

Packard Model 6-Cylinder Year 1937

Battery Willard **Type** **Volts** 6-8 **Amps.** 94

Frame Connection Positive

Lighting
- **Head Lights** 6-8 Volts
- **Stop Light** 6-8 Volts **Tail** 6-8 Volts
- **Parking Lights** 6-8 Volts

Starter and Generator Delco-Remy

Generator Delco-Remy
- **Max. Chg. Rate** 18 Amps. Hot **Speed** 3500 R.P.M., Arm.
- **Regulation** Voltage **Cut-in** 6.5 Volts, 710 R.P.M.
- **Relay Air Gap** **Contact Gap**

Ignition Delco-Remy
- **Contact Breaker Gap** .018″
- **Spark Plug—Size** 10 M.M. **Gap** .028″
- **Firing Order** 1-5-3-6-2-4
- **Timing** 4° B.T.C.

Engine **Bore** 3 7/16″ **Stroke** 4 1/4″ **Taxable H.P.** 28.36
- **Piston Ring—Width** Oil 1—3/16″ Comp. 2—1/8″
- **Diam.** 3 7/16″ **Gap** Oil .007″ Comp. .007″
- **Oiling—Type** Gear Pump **Capacity** 7 Qts. **Pressure** 35 Lbs.

Valves
- **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
- **Intake Clearance** Hot .007″
- **Exhaust Timing—Open** 45° B.B.C. **Close** 5° A.T.C.
- **Exhaust Clearance** Hot .010″

Carburetor Chandler-Groves AOC2

Steering Caster 2° Camber 1° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 17 Qts.

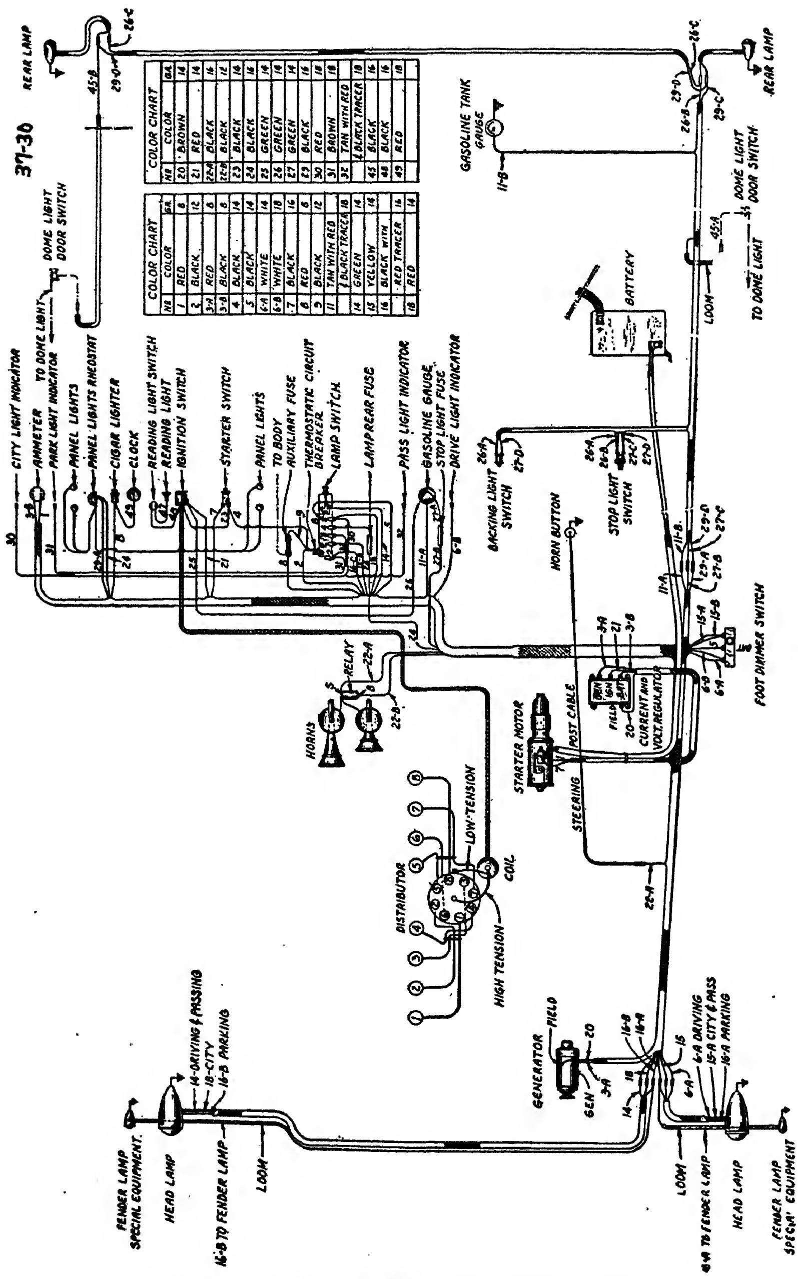
Clutch Long **Facings** Woven 6″ x 9 1/2″ x 1/8″ 2 Required

Gear Ratio Ring Gear 48 Pinion 11 Hypoid Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
- **Front** 26″ x 1 3/4″ x 3/16″ Clearance .010″
- **Rear** 26″ x 1 3/4″ x 3/16″ Clearance .010″
- **Hand** Rear Service

Diagram 37-29



COLOR CHART		
NO	COLOR	GA.
1	RED	8
2	BLACK	12
3-A	RED	8
3-B	BLACK	8
4	BLACK	14
5	BLACK	14
6-A	WHITE	14
6-B	WHITE	18
7	BLACK	16
8	RED	8
9	BLACK	12
11	TAN WITH RED BLACK TRACER	18
14	GREEN	14
15	YELLOW	14
16	BLACK WITH RED TRACER	16
18	RED	14

COLOR CHART		
NO	COLOR	GA.
20	BROWN	14
21	RED	14
22-A	BLACK	16
22-B	BLACK	12
23	BLACK	14
24	BLACK	16
25	GREEN	14
26	GREEN	14
27	GREEN	14
29	BLACK	16
30	RED	18
31	BROWN	18
32	TAN WITH RED BLACK TRACER	18
45	BLACK	16
48	BLACK	16
49	RED	18

PACKARD WIRING DIAGRAM, 1937, MODEL SUPER 8

Courtesy of Packard Motor Car Company

Packard **Model Super 8** **Year 1937**

Battery Various Makes **Type** **Volts** 6-8 **Amps.** 150

Frame Connection Positive

Lighting
Head Lights 6-8 Volts
Stop Light 6-8 Volts **Tail** 6-8 Volts
Parking Lights 6-8 Volts

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 25 Amps. Hot **Speed** 1650 R.P.M., Arm.
Regulation Volt. & Current **Cut-in** 6.5 Volts, 800 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .013″
Spark Plug—Size 10 M.M. **Gap** .028″
Firing Order 1-6-2-5-8-3-7-4
Timing 6° B.T.C.

Engine **Bore** 3 3/16″ **Stroke** 5″ **Taxable H.P.** 32.50
Piston Ring—Width Oil 2—5/32″ Comp. 2—1/8″
Diam. 3 3/16″ **Gap** Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 8 Qts. **Pressure** 35 Lbs.

Valves **Intake Timing—Open** 30° B.T.C. **Close** 65° A.B.C.
Intake Clearance Hot .004″
Exhaust Timing—Open 65° B.B.C. **Close** 30° A.T.C.
Exhaust Clearance Hot .006″

Carburetor Stromberg EE23

Steering Caster 2° Camber 1° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 24 Qts.

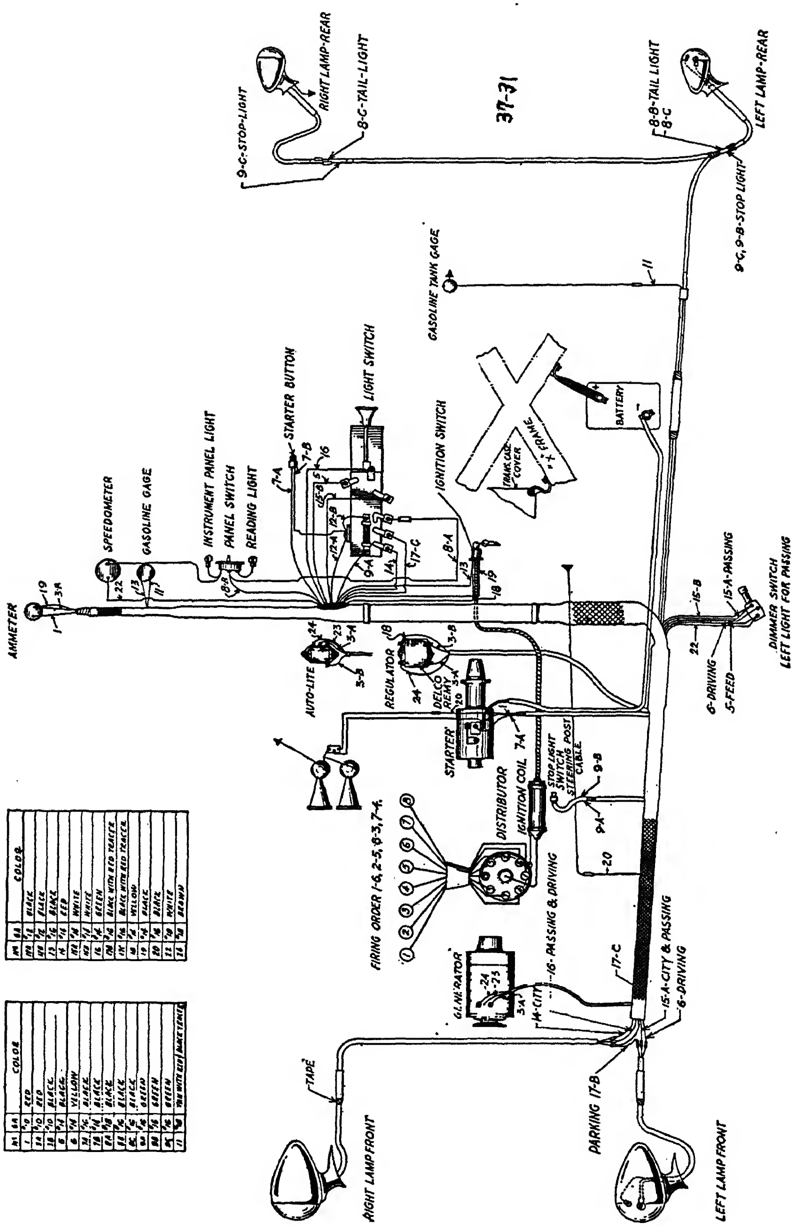
Clutch Long **Facings** Moulded 7″ x 12″ x .137″ 2 Required

Gear Ratio Ring Gear 61 Pinion 14 Hypoid Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 26″ x 2 1/2″ x 3/16″ **Clearance** .010″
Rear 26″ x 2 1/2″ x 3/16″ **Clearance** .010″
Hand Rear Service

Lining **Diagram 37-30**



PACKARD WIRING DIAGRAM, 1937, MODEL 120

Courtesy of Packard Motor Car Company

Packard Model 120 Year 1937

Battery Various Makes **Type** **Volts** 6-8 **Amps.** 114
Frame Connection Positive

Lighting
Head Lights 6-8 Volts
Stop Light 6-8 Volts **Tail** 6-8 Volts
Parking Lights 6-8 Volts

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 22 Amps. Hot **Speed** 2500 R.P.M., Arm.
Regulation Voltage and Current **Cut-in** 7 Volts, 750 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .013″
Spark Plug—Size 10 M.M. **Gap** .028″
Firing Order 1-6-2-5-8-3-7-4
Timing 7° B.T.C.

Engine **Bore** 3¼″ **Stroke** 4¼″ **Taxable H.P.** 33.80
Piston Ring—Width Oil 1—$\frac{3}{16}$″ Comp. 2—⅛″
Diam. 3¼″ **Gap** Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 7 Qts. **Pressure** 35 Lbs.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance Hot .007″
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance Hot .010″

Carburetor Stromberg EE14

Steering Caster 2° Camber 1° Toe-in $\frac{1}{16}$″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 20 Qts.

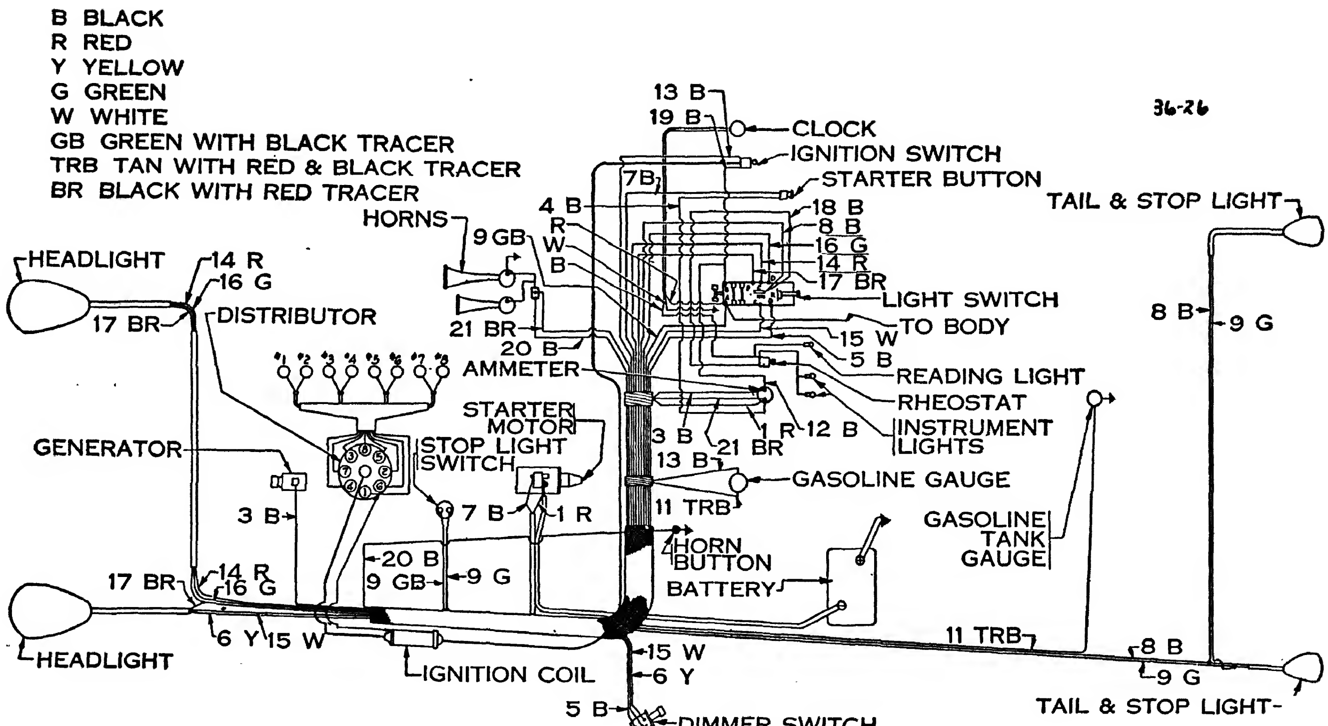
Clutch Long **Facings** Woven 6″ x 10″ x .137″. 2 Required

Gear Ratio Ring Gear 45 Pinion 11 Hypoid Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front 26″ x 1¾″ x $\frac{3}{16}$″ Clearance .010″
Rear 26″ x 1¾″ x $\frac{3}{16}$″ Clearance .010″
Hand Rear Service
Lining

Diagram 37-31



PACKARD WIRING DIAGRAM, 1936, MODEL 120
Courtesy of Packard Motor Car Company

Packard **Model 120** **Year 1936**

Battery Delco-Remy **Type** **Volts** 6 **Amps.** 110
Frame Connection Positive

Lighting **Head Lights** 6-8, 32-32 C.P.
Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 1 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite — **Max. Chg. Rate** 20 Amps. Hot
Regulation 3rd Brush and Voltage Control **Cut-in** 7-7¼ Volts
Contact Gap

Ignition **Contact Breaker Gap** .018″-.022″
Spark Plug—Size 14 M.M. **Gap** .028″
Firing Order 1-6-2-5-8-3-7-4
Timing 7° B.T.C.

Engine **Bore** 3¼″ **Stroke** 4¼″ **Taxable H.P.** 33.8
Piston Ring—Width Oil 3/16″ Comp. ⅛″
Diam. 3¼″ **Gap** Oil .007″-.015″ Comp. .007″-.012″
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance .007″ Hot
Exhaust Timing—Open 45° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .010″ Hot

Carburetor Stromberg EE14

Steering Caster 2° Camber 1° Toe-in ⅛″

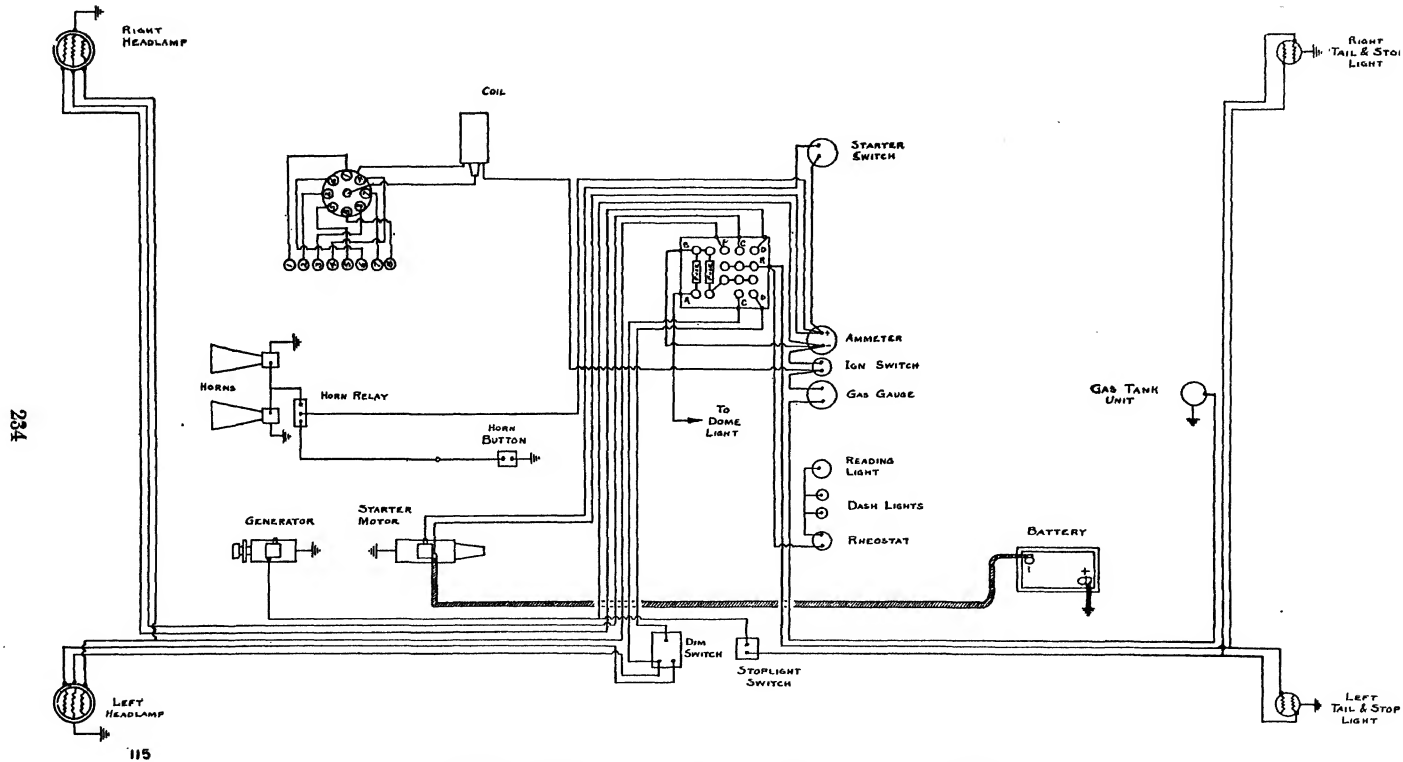
Cooling System Pump **Type** Centrifugal **Capacity** 18 Qts.

Clutch Long **Facings** Woven 6″ x 10″ x .137″ 2 Required

Gear Ratio 4.09 to 1 Hypoid Gears

Axle Own Semi-Floating

Brakes Hydraulic Servo — **Front** 13″ x 1¾″ x 3/16″ Clearance .010″
Rear 13″ x 1¾″ x 3/16″ Clearance .010″
Hand Rear Wheels
Lining U. S. Asbestos Primary No. 714, Secondary No. 589



PACKARD WIRING DIAGRAM, 1935, MODEL 120, 8-CYLINDER

Courtesy of Packard Motor Car Company

Packard **Model 120, 8-Cylinder** **Year 1935**

Battery Prest-O-Lite **Type** **Volts** 6 **Amps.** 114
Frame Connection Positive

Lighting Mazda 2330 **Head Lights** 6-8, 32-32 C.P.
Dash, Tail and Stop 6-8, 3-3-15 C.P.
Side Lights 6-8, 1 C.P.

Starter and Generator Auto-Lite

Generator Cold **Max. Chg. Rate** 23 Amps. **Speed**
Regulation 3rd Brush **Cut-in** 7-7.4 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .018″-.022″
Spark Plug—Size 14 M.M. **Gap** .025″-.027″
Firing Order 1-6-2-5-8-3-7-4
Timing 5° B.T.C. Full Advance

Engine **Bore** 3¼″ **Stroke** 3⅞″ **Taxable H.P.** 33.80
Piston Ring—Width Oil 5/32″ Comp. ⅛″
Diam. 3¼″ **Gap** .007″-.012″ on All
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance .007″ Warm
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .009″ Warm

Carburetor Stromberg EE14

Steering Caster 2° Camber 1° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 16½ Qts.

Clutch Long **Facings** Woven 6″ x 10″ x .137″ 2 Required

Gear Ratio Gears Hypoid

Axle Own Semi-Floating

Brakes Bendix Hydraulic
- **Front** 26″ x 1¾″ x 3/16″ Clearance .010″
- **Rear** 26″ x 1¾″ x 3/16″ Clearance .010″
- **Hand** Rear Service

Lining Moulded

Diagram 115

Packard Models 1100, 1101 and 1102, 8-Cylinder Year 1934

Battery Prest-O-Lite **Type** 619-ST **Volts** 6 **Amps.** 144
Frame Connection Positive

Lighting Mazda 3003 **Head Lights** 6-8, 32-32-32 C.P.
Mazda 63, 87 **Dash, Tail and Stop** 6-8, 3-3-15 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Owen-Dyneto

Generator **Max. Chg. Rate** 24 Amps. **Speed** 1400 R.P.M.
Regulation 3rd Brush **Cut-in** 6.5 Volts
Relay Air Gap .010″ **Contact Gap** .015″

Ignition Delco-Remy **Contact Breaker Gap** .020″
Spark Plug—Size 14 MM. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing Standard Head 6° B.T.C. High Comp. 8° B.T.C.

Engine **Bore** 3$\frac{3}{16}$″ **Stroke** 5″ **Taxable H.P.** 32.5
Piston Ring—Width Oil 1—$\frac{5}{32}$″ Comp. 3—$\frac{1}{8}$
Diam. 3$\frac{3}{16}$″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** 30° B.T.C. **Close** 65° A.B.C.
Intake Clearance .004″ Hot
Exhaust Timing—Open 65° B.B.C. **Close** 30° A.T.C.
Exhaust Clearance .006″ Hot

Carburetor Stromberg EE22

Steering Caster 1½° Camber 1½° Toe-in $\frac{1}{16}$″

Cooling System Centrifugal **Type** Pump **Capacity** 5 Gals.

Clutch Long **Facings** Moulded 7″ x 12″ x .137″ 2 Required

Gear Ratio Hypoid Gears

Axle Own Semi-Floating

Brakes Bendix Mechanical **Front** 30¼″ x Left 1¾″, Right 2¼″ x ¼″ Clearance .010″
Rear 30¼″ x 2¼″ x ¼″ Clearance .010″
Hand 4 Wheels
Lining Moulded and Semi-Moulded

Packard Models 1001 and 1002, 8-Cylinder Year 1933

Battery Prest-O-Lite **Type** A-619-ST **Volts** 6 **Amps.** 144
Frame Connection Positive

Lighting Triple Contact **Head Lights** 6-8, 32-32-32 C.P.
Single Contact **Dash, Tail and Stop** 6-8, 3-3-15 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Owen-Dyneto

Generator Hot **Max. Chg. Rate** 18 Amps. **Speed** 1300 R.P.M.
Regulation 3rd Brush **Cut-in** 6.2 Volts
Relay Air Gap .010″ **Contact Gap** .015″

Ignition North East **Contact Breaker Gap** .020″
Spark Plug—Size 14 MM. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing Standard Compression 9° Flywheel B.T.C.

Engine **Bore** $3\frac{3}{16}$″ **Stroke** 5″ **Taxable H.P.** 32.50
Piston Ring—Width Oil 1—$\frac{5}{32}$″ **Comp.** 3—$\frac{1}{8}$″
Diam. $3\frac{3}{16}$″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** 30° B.T.C. **Close** 65° A.B.C.
Intake Clearance .004″ Hot
Exhaust Timing—Open 65° B.B.C. **Close** 30° A.T.C.
Exhaust Clearance .004″ Hot

Carburetor Stromberg EE22

Steering Caster $3\frac{1}{4}$° Camber $1\frac{1}{2}$° Toe-in $\frac{1}{16}$″

Cooling System Centrifugal **Type** Pump **Capacity** 5 Gals.

Clutch Long **Facings** Moulded 6″ x 11″ x .137″ 2 Required

Gear Ratio Hypoid Gears

Axle Own Semi-Floating

Brakes Bendix Booster Mechanical
Front $43\frac{1}{4}$″ x $1\frac{3}{4}$″ x $\frac{1}{4}$″ Clearance .010″
Rear $43\frac{1}{4}$″ x $1\frac{3}{4}$″ x $\frac{1}{4}$″ Clearance .010″
Hand 4 Wheels
Lining Moulded and Semi-Moulded

Pierce Arrow **Model 8-36A** **Year 1934**

Battery	Willard	Type WH-4-17	**Volts** 6	**Amps.** 136
		Frame Connection	Positive	

Lighting	Mazda 1000	**Head Lights**	6-8, 32-32 C.P.
	Mazda 63, 1129	**Dash, Tail and Stop**	6-8, 3-6-21 C.P.
	Mazda 81	**Side Lights**	6-8, 6 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 12-14 Amps. **Speed** 1800 R.P.M

Regulation 3rd Brush **Cut-in** 6.75-7.5 Volts

Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″

Spark Plug—Size 14 MM. **Gap** .025″

Firing Order 1-6-2-5-8-3-7-4

Timing 5° B.T.C.

Engine **Bore** 3½″ **Stroke** 4¾″ **Taxable H.P.** 39.2

Piston Ring—Width Oil 2—³⁄₁₆″ Comp. 2—⅛″

Diam. 3½″ **Gap** Oil .015″-.028″ Comp. .015″

Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** 5° A.T.C. **Close** 45° A.B.C.

Intake Clearance .000″

Exhaust Timing—Open 40° B.B.C. **Close** 12° A.T.C.

Exhaust Clearance .000″

Carburetor Stromberg EE3

Steering Caster ¾° Camber 1° Toe-in ¼″

Cooling System Centrifugal **Type** Pump **Capacity** 6½ Gals.

Clutch Long **Facings** Moulded 6¼″ x 9¾″ x .130″ 4 Required

Gear Ratio Ring Gear 55 Pinion 13 Hypoid

Axle Own Semi-Floating

Brakes Stewart Mechanical
- **Front** 38″ x 2¼″ x .270″
- **Rear** 38″ x 2¼″ x .270″
- **Hand** 4 Wheels

Lining Moulded

Pierce Arrow Model 836 Year 1933

Battery Willard **Type** WH-4-17 **Volts** 6 **Amps.** 136
Frame Connection Positive

Lighting Double Contact **Head Lights** 6-8, 32-32 C.P.
Single Contact **Dash, Tail and Stop** 6-8, 3-6-21 C.P.
Single Contact **Side Lights** 6-8, 6 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 12-14 Amps. **Speed** 1800 R.P.M.
Regulation 3rd Brush **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size ⅞″—18 S.A.E. **Gap** .025″-.030″
Firing Order 1-6-2-5-8-3-7-4
Timing 5° B.T.C. Full Advance

Engine **Bore** 3½″ **Stroke** 4¾″ **Taxable H.P.** 39.20
Piston Ring—Width Oil 1—3/16″ Comp. 3—⅛″
Diam. 3½″ **Gap** Oil .013″ Comp. .015″
Oiling—Type Pump **Capacity** 9 Qts.

Valves **Intake Timing—Open** 5° A.T.C. **Close** 45° A.B.C.
Intake Clearance .010″ for Timing, None in Service
Exhaust Timing—Open 40° B.B.C. **Close** 12° A.T.C.
Exhaust Clearance .010″ for Timing, None in Service

Carburetor Stromberg EE-3

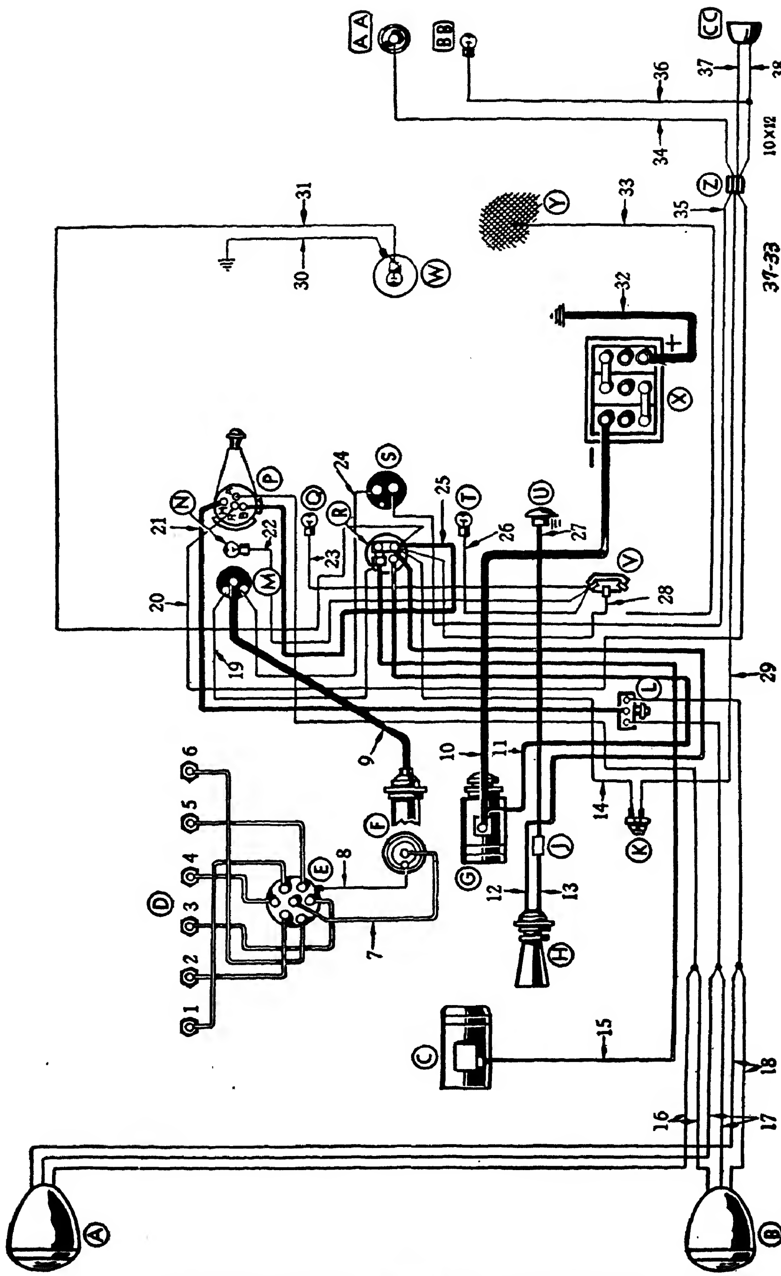
Cooling System Centrifugal **Type** Pump **Capacity** 6½ Gals.

Clutch Long **Facings** Moulded 6¼″ x 9¾″ x .130″ 4 Required

Gear Ratio Ring Gear 30 Worm 7 Worm Gears

Axle Own Full-Floating

Brakes Mechanical **Front** 38″ x 2¼″ x .270″
Rear 38″ x 2¼″ x .270″
Hand 4 Wheels
Lining Moulded



PLYMOUTH WIRING DIAGRAM, 1937, 6-CYLINDER

Courtesy of Chrysler Corporation

Plymouth **Model 6-Cylinder** **Year 1937**

Battery Willard **Type** **Volts** 6-8 **Amps.** 90
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P.
Mazda 1158 **Stop Light** 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Mazda 55 **Parking Lights** 6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 12.5 Amps. Hot **Speed** 2400 R.P.M., Arm.
Regulation Voltage **Cut-in** 7 Volts, 820 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 4° A.T.C.

Engine **Bore** 3⅛″ **Stroke** 4⅜″ **Taxable H.P.** 23.44
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3⅛″ **Gap** Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 46° A.B.C.
Intake Clearance Hot .006″ Operating, .011″ Timing
Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.
Exhaust Clearance Hot. 008″ Operating, .012″ Timing

Carburetor Carter BB

Steering Caster 2° Camber ½° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 15 Qts.

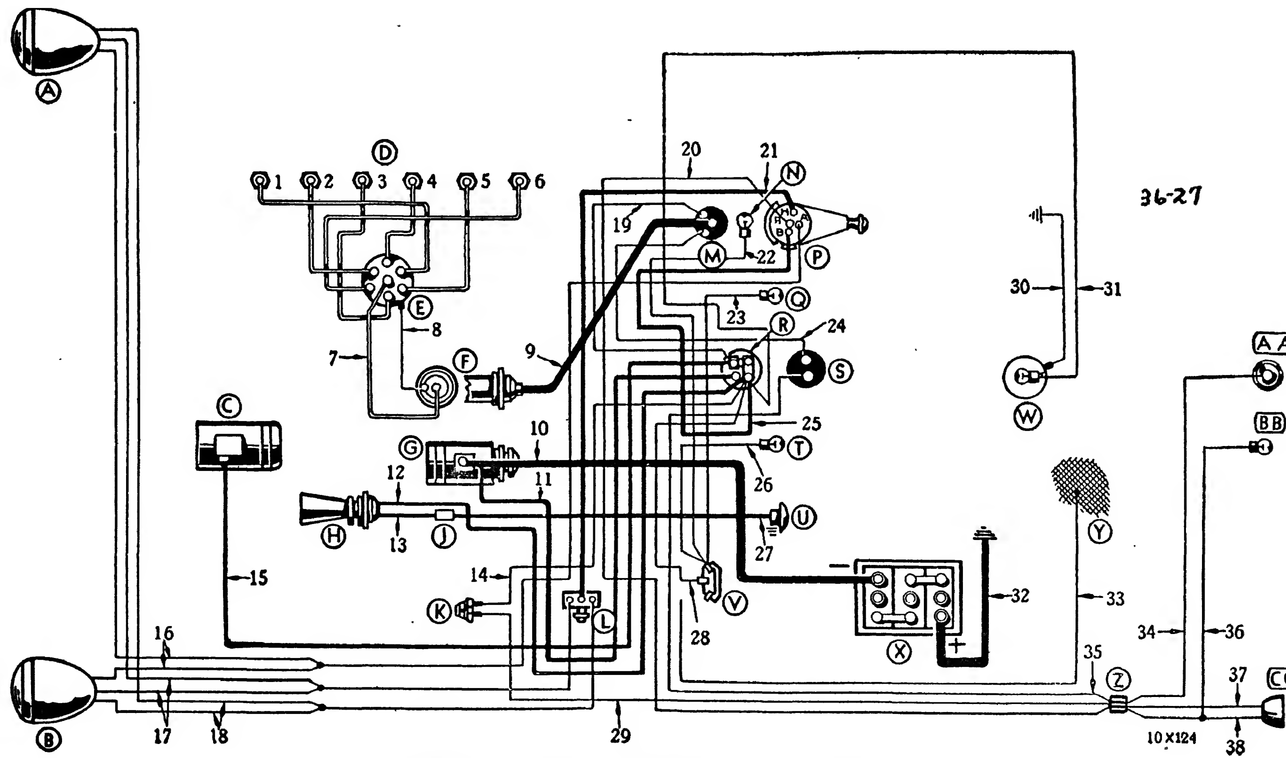
Clutch Borg & Beck **Facings** Moulded and Woven 5⅝″ x 9¼″ x .133″ 2 Required

Gear Ratio Ring Gear 41 Pinion 10 Hypoid Gears

Axle Own ¾-Floating

Brakes Lockheed Hydraulic
Front 19 13/16″ x 2″ x 13/64″ Clearance .006″ Heel, .012″ Toe
Rear 17 19/64″ x 2″ x 13/64″ Clearance .006″ Heel, .012″ Toe
Hand Transmission 6 5/16″ x 2″ x 5/32″

Lining Moulded Diagram 37-33



PLYMOUTH WIRING DIAGRAM, 1936, MODEL, MASTER
Courtesy of Chrysler Corporation

Plymouth **Model Master** **Year 1936**

Battery Willard **Type** **Volts 6** **Amps.** [illegible]

Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P.

Stop Light 6-8, 21 C.P. **Tail** 6-8, 3 C.P.

Parking Lights 6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 21 Amps. with Voltage Control
Regulation 3rd Brush and Voltage Control
Speed 26 M.P.H.
Cut-in 6.5-7.3 Volts
Contact Gap .015″-.025″

Ignition Auto-Lite
Contact Breaker Gap .020″

Spark Plug—Size 14 M.M. **Gap** .025″

Firing Order 1-5-3-6-2-4

Timing 4° A.T.C.

Engine **Bore** 3⅛″ **Stroke** 4⅜″ **Taxable H.P.** 23.44

Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3⅛″ **Gap** .007″-.015″

Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 46° A.B.C.

Intake Clearance .006″ Hot

Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.

Exhaust Clearance .008″ Hot

Carburetor Ball & Ball

Steering Caster 2° Camber ½° Toe-in 0″ to ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 15 Qts.

Clutch Borg & Beck **Facings** Moulded and Woven 5⅝″ x 9¼″ x .133″
2 Required

Gear Ratio 4.125 to 1 Spiral Gears

Axle Semi-Floating

Brakes Bendix Hydraulic
Front 19 13/16″ x 2″ x 13/64″ Clearance Toe .012″ Heel .006″
Rear 19 13/16″ x 2″ x 13/64″ Clearance Toe .012″ Heel .006″
Hand Transmission 18 13/32″ x 2″ x 5/32″ Clearance 1/16″

Lining Moulded Diagram 36-27

Plymouth Models PF and PG Year 1934

Battery	Willard	**Type** WS-1-13	**Volts** 6	**Amps.** 86
		Frame Connection	Positive	
Lighting	Mazda 1110	**Head Lights**	6-8, 21-21 C.P.	
	Mazda 63, 1158	**Dash, Tail and Stop**	6-8, 3-2-21 C.P.	
	Mazda 63	**Side Lights**	6-8, 3 C.P.	

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 10-13 Amps. **Speed** 2100 R.P.M.
Regulation 3rd Brush **Cut-in** 6.5-7.3 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 14 MM. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing Cast Iron Head 9° B.T.C. High Comp. Head 6° B.T.C.

Engine **Bore** 3⅛″ **Stroke** **Taxable H.P.** 23.44
Piston Ring—Width Oil 1—⅛″, 1—5/32″ Comp. 2—⅛″
Diam. 3⅛″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 46° A.B.C.
Intake Clearance .005″ Hot
Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.
Exhaust Clearance .007″ Hot

Carburetor Ball & Ball

Steering Caster 1°-3° Camber ¼°-¾° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 3¾ Gals.

Clutch Borg & Beck **Facings** Moulded 5¾″ x 9″ x .133″ 2 Required

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Lockheed Hydraulic	**Front**	15 23/32″ x 1½″ x 3/16″	Clearance Heel .006″	Toe .012″
	Rear	15 23/32″ x 1½″ x 3/16″	Clearance Heel .006″	Toe .012″
	Hand	Transmission 18 13/32″ x 2″ x 5/32″	Clearance 1/16″	
	Lining	Moulded		

Plymouth **Model New Six PC** **Year 1933**

Battery Willard **Type** WS-1-13 **Volts** 6 **Amps.** 86
Frame Connection Positive

Lighting Double Contact **Head Lights** 6-8, 32-21 C.P.
Double Contact **Stop & Tail** 6-8, 21-2 C.P.
Single Contact **Side Lights & Dash** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 13-15 Amps. **Speed** 2800-3000 R.P.M.
Regulation 3rd Brush, Thermo. **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order —1-5-3-6-2-4
Timing Silver Dome 622-H 10° B.T.D.C.
Red Head 622-H 8° B.T.D.C.
Silver Dome 644-H At T.D.C.
Red Head 644-10 At T.D.C.

Engine **Bore** 3-1/8″ **Stroke** 4-1/8″ **Taxable H.P.** 23.44
Piston Ring—Width 1-5/32″, 3-1/8″ **Diam.** 3-1/8″ **Gap All Rings** .007″
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 46° A.B.C.
Intake Clearance .005″ Hot
Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.
Exhaust Clearance .007″ Hot

Carburetor Ball & Ball

Cooling System Centrifugal **Type** Pump **Capacity** 3-1/4 Gals.

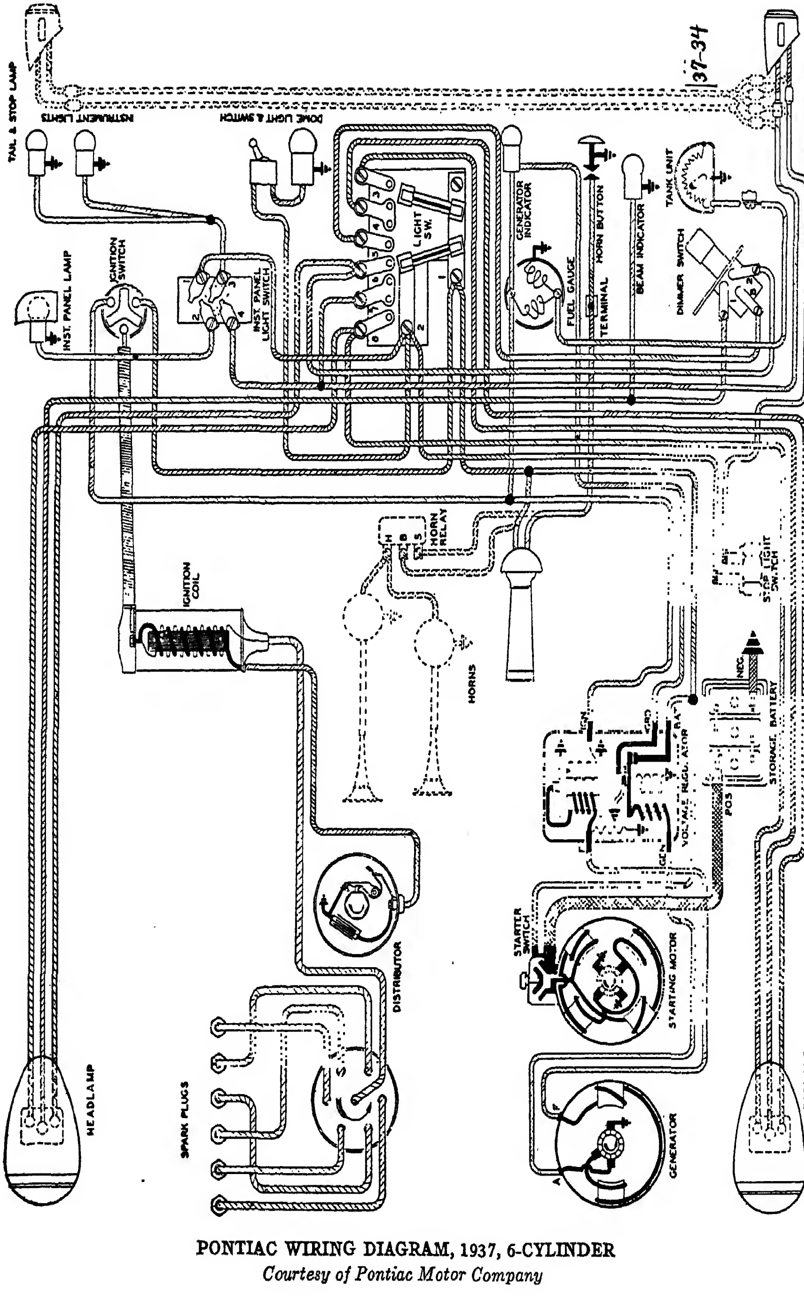
Clutch Borg & Beck **Facing**—Moulded 9″ x 5-3/4″ x .133″

Gear Ratio Ring Gear 35 Pinion 8 Spiral Gears

Axle Own Semi-Floating

				Heel	Toe
Brakes Lockheed	**Front**	18-5/16″ x 1-1/2″ x 3/16″	Clearance	.006″	.012″
Hydraulic	**Rear**	18-5/16″ x 1-1/2″ x 3/16″	Clearance	.006″	.012″

Hand Trans. 18-13/32″ x 2″ x 5/32″ Clearance 1/16″
Lining—Moulded



PONTIAC WIRING DIAGRAM, 1937, 6-CYLINDER

Courtesy of Pontiac Motor Company

Pontiac **Model 6-Cylinder** **Year 1937**

Battery Delco-Remy **Type** **Volts** 6-8 **Amps.** 94
Frame Connection Negative

Lighting **Head Lights** 6-8 Volts
Stop Light 6-8 Volts **Tail** 6-8 Volts
Parking Lights 6-8 Volts

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 18 Amps. Hot **Speed** 3500 R.P.M., Arm.
Regulation Voltage **Cut-in** 6.5 Volts, 830 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .018″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 2° B.T.C.

Engine **Bore** 3 7/16″ **Stroke** 4″ **Taxable H.P.** 28.30
Piston Ring—Width Oil 1—3/16″ Comp. 2—1/8″
Diam. 3 7/16″ **Gap** Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 6 Qts. **Pressure** 35 Lbs. @40 M.P.H.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance Hot .011″ Operating, .015″ Timing
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance Hot .011″ Operating, .015″ Timing

Carburetor Carter 352S

Steering Caster 0° Camber 1° Toe-in 0″

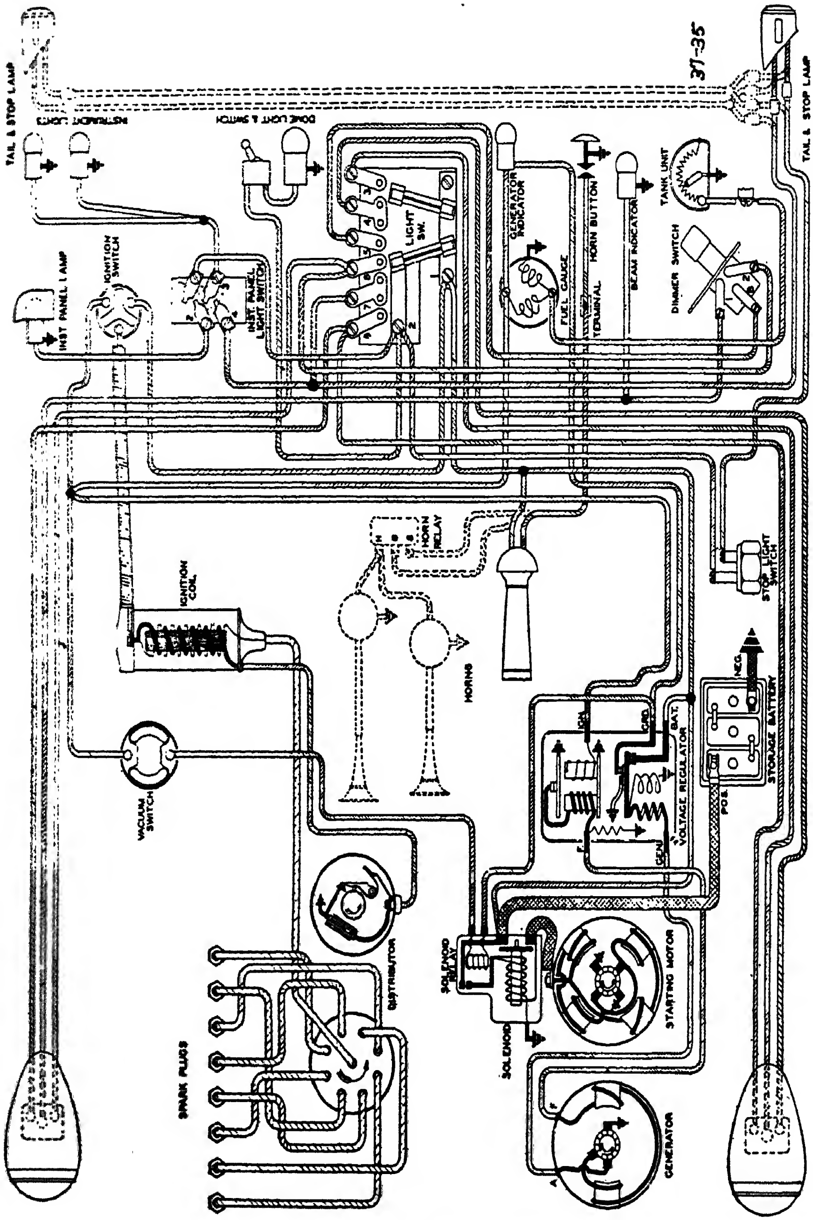
Cooling System Centrifugal **Type** Pump, Belt **Capacity** 16 Qts.

Clutch Long **Facings** Woven 6″ x 10″ x 1/8″ 2 Required

Gear Ratio Ring Gear 35 Pinion 8 Spiral Gears

Axle Own Semi-Floating

Bendix Hydraulic
Front 23 1/16″ x 1 3/4″ x 3/16″ Clearance .010″
Rear 23 1/16″ x 1 3/4″ x 3/16″ Clearance .010″
Hand Rear Service
Lining Moulded **Diagram** 37-34



PONTIAC WIRING DIAGRAM, 1937, 8-CYLINDER

Courtesy of Pontiac Motor Company

Pontiac **Model 8-Cylinder** **Year 1937**

Battery Delco-Remy **Type** **Volts** 6-8 **Amps.** 110
Frame Connection Negative

Lighting **Head Lights** 6-8 Volts
Stop Light 6-8 Volts **Tail** 6-8 Volts
Parking Lights 6-8 Volts

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 18 Amps. Hot **Speed** 3500 R.P.M., Arm.
Regulation Voltage **Cut-in** 6.5 Volts, 830 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .015″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing 2° B.T.C.

Engine **Bore** $3\frac{1}{4}$″ **Stroke** $3\frac{3}{4}$″ **Taxable H.P.** 33.80
Piston Ring—Width Oil 1—$\frac{3}{16}$″ Comp. 2—$\frac{1}{8}$″
Diam. $3\frac{1}{4}$″ **Gap** Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 7 Qts. **Pressure** 35 Lbs. @45 M.P.H.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance Hot. 011″ Operating, .015″ Timing
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance Hot. 011″ Operating, .015″ Timing

Carburetor Carter 350S

Steering Caster 0° Camber 1° Toe-in 0″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 19 Qts.

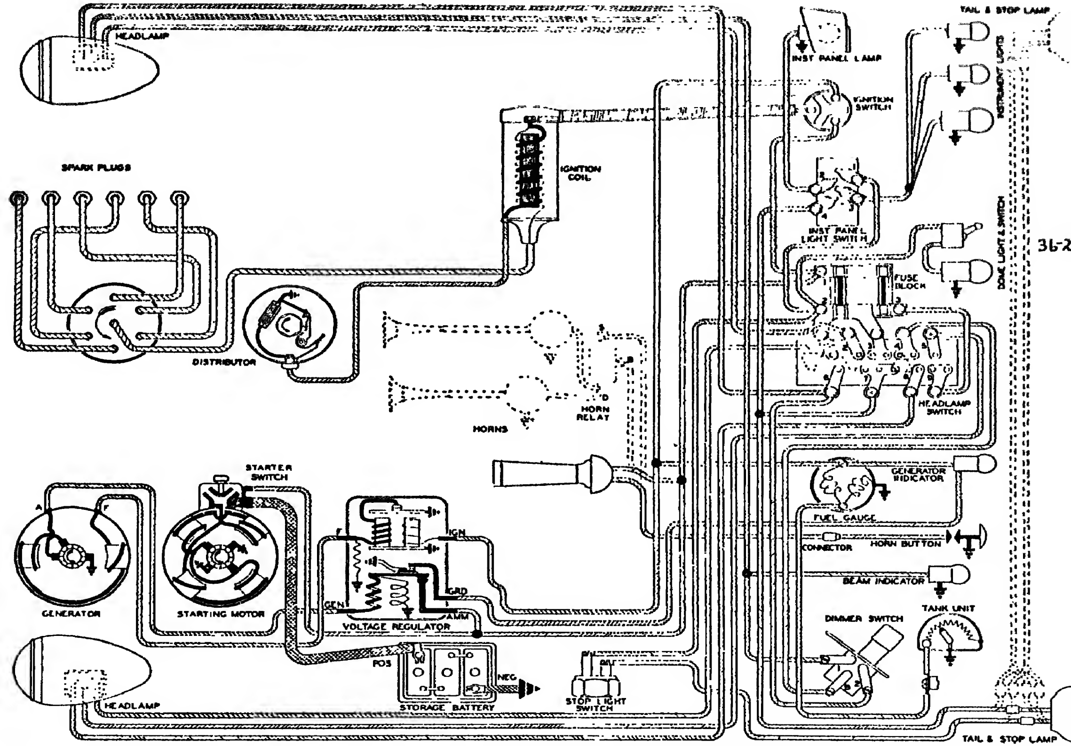
Clutch Long, Driven Plate **Facings** Woven 6″ x 10″ x $\frac{1}{8}$″ 2 Required

Gear Ratio Ring Gear 35 Pinion 8 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Hydraulic
Front $23\frac{1}{16}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″ Clearance .010″
Rear $23\frac{1}{16}$″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″ Clearance .010″
Hand Rear Service

Lining Moulded **Diagram** 37-35



PONTIAC WIRING DIAGRAM, 1936, MODEL, 6-CYLINDER
Courtesy of Pontiac Motor Company

Pontiac **Model 6-Cylinder** **Year 1936**

Battery Delco-Remy **Type** **Volts** 6 **Amps.** 94
Frame Connection Negative

Lighting **Head Lights** 6-8, 32-21 C.P.
Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy **Max. Chg. Rate** 21 Amps. Hot **Speed** 10 M.P.H.
Regulation 3rd Brush **Cut-in** 6.5 Volts
Voltage Control, Air Gap .018″-.022″ **Contact Gap** .018″-.025″

Ignition Remy **Contact Breaker Gap** .020″
Spark Plug—Size 14 M.M. **Gap** Radio .022″; Reg. .025″
Firing Order 1-5-3-6-2-4
Timing 4° Between Lines "IGN," 1 and 6

Engine **Bore** 3⅜″ **Stroke** 3⅞″ **Taxable H.P.** 27.4
Piston Ring—Width Oil 3/16″, **Comp.** ⅛″
Diam. 3⅜″ **Gap** .007″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance .009″-.011″ Hot
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .009″-.011″ Hot

Carburetor Carter 324S

Steering Caster 0° Camber 0° Toe-in 0″

Cooling System Pump **Type** Centrifugal **Capacity** 14 Qts.

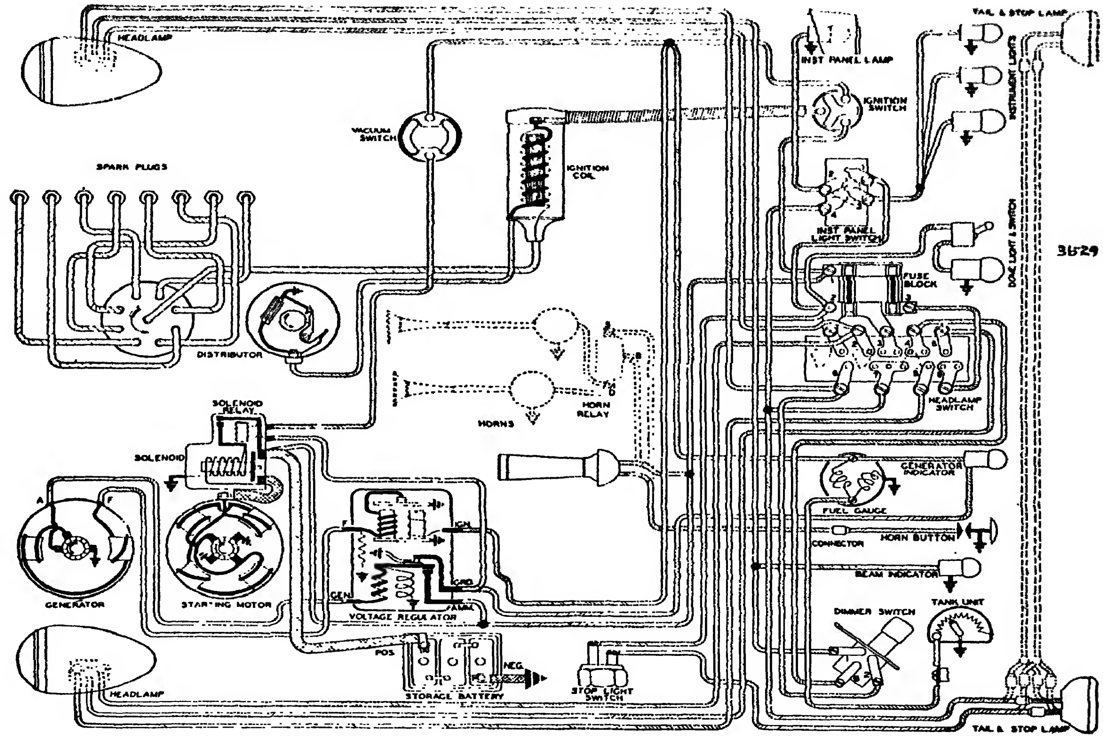
Clutch Long **Facings** Woven 6″ x 10″ x ⅛″ 2 Required

Gear Ratio 4.44 to 1

Axle Own Semi-Floating

Brakes Hydraulic
Front 23 1/16″ x 1¾″ x 3/16″
Rear 23 1/16″ x 1¾″ x 3/16″
Hand Rear Service

Lining Moulded **Diagram** 36-28



PONTIAC WIRING DIAGRAM, 1936, MODEL, 8-CYLINDER
Courtesy of Pontiac Motor Company

Pontiac **Model 8-Cylinder** **Year 1936**

Battery Delco-Remy **Type** **Volts** 6 **Amps.** 107
Frame Connection Negative

Lighting 2-Filament **Head Lights** 6-8, 32-21 C.P.
Stop Light 6-8, 15 C.P. **Tail** 6-8, 3 C.P.
Parking Lights 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 21 Amps. Hot **Speed** 10 M.P.H.
Regulation 3rd Brush **Cut-in** 6.5 Volts
Voltage Control, Air Gap .018″-.022″ **Contact Gap** .018″-.025″

Ignition Delco-Remy
Contact Breaker Gap .018″
Spark Plug—Size 14 M.M. **Gap** Radio .022″ Reg. .025″
Firing Order 1-6-2-5-8-3-7-4
Timing 2° B.T.C. Retard

Engine **Bore** 3¼″ **Stroke** 3½″ **Taxable H.P.** 33.8
Piston Ring—Width Oil 3/16″ Comp. ⅛″
Diam. 3¼″ **Gap** .007″
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance .009″-.011″ Hot
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .009″-.011″ Hot

Carburetor Carter 322S

Steering Caster 0° Camber 0° Toe-in 0

Cooling System Pump **Type** Centrifugal **Capacity** 15 Qts.

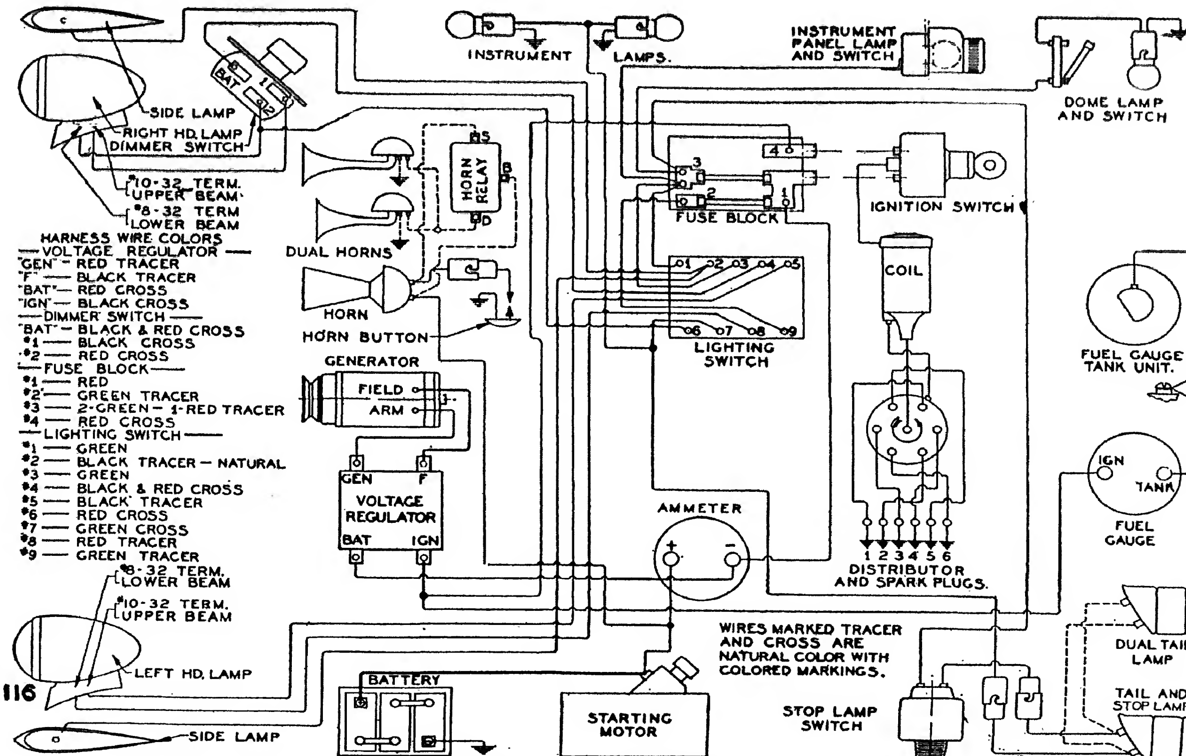
Clutch Long **Facings** Woven 6″ x 10″ x ⅛″ 2 Required

Gear Ratio 4.5 to 1

Axle Own Semi-Floating

Brakes Hydraulic
Front 23 1/16″ x 1¾″ x 3/16″
Rear 23 1/16″ x 1¾″ x 3/16″
Hand Rear Service

Lining Moulded **Diagram** 36-29



PONTIAC WIRING DIAGRAM, 1935, MODEL 6-CYLINDER

Courtesy of Pontiac Motor Company

Pontiac **Model 6-Cylinder** **Year 1935**

Battery Delco-Remy **Type** **Volts** 6 **Amps.** 94
Frame Connection Negative

Lighting
Head Lights 6-8, 21-32 C.P.
Dash, Tail and Stop 6-8, 3-3-15 C.P.
Side Lights 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 18 Amps. **Speed** 40 M.P.H.
Regulation 3rd Brush **Cut-in** 6.5 Volts
Relay Air Gap **Contact Gap**

Ignition
Contact Breaker Gap .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 9° B.T.C. Retard

Engine **Bore** 3⅜″ **Stroke** 3⅞″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 1—3/16″ Comp. 3—⅛″
Diam. 3⅜″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance .009″ Hot
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .011″ Hot

Carburetor Carter WI-306-S

Steering Caster 19¾° Camber 0° Toe-in 1/32″

Cooling System Centrifugal **Type** Pump **Capacity** 3¾ Gals.

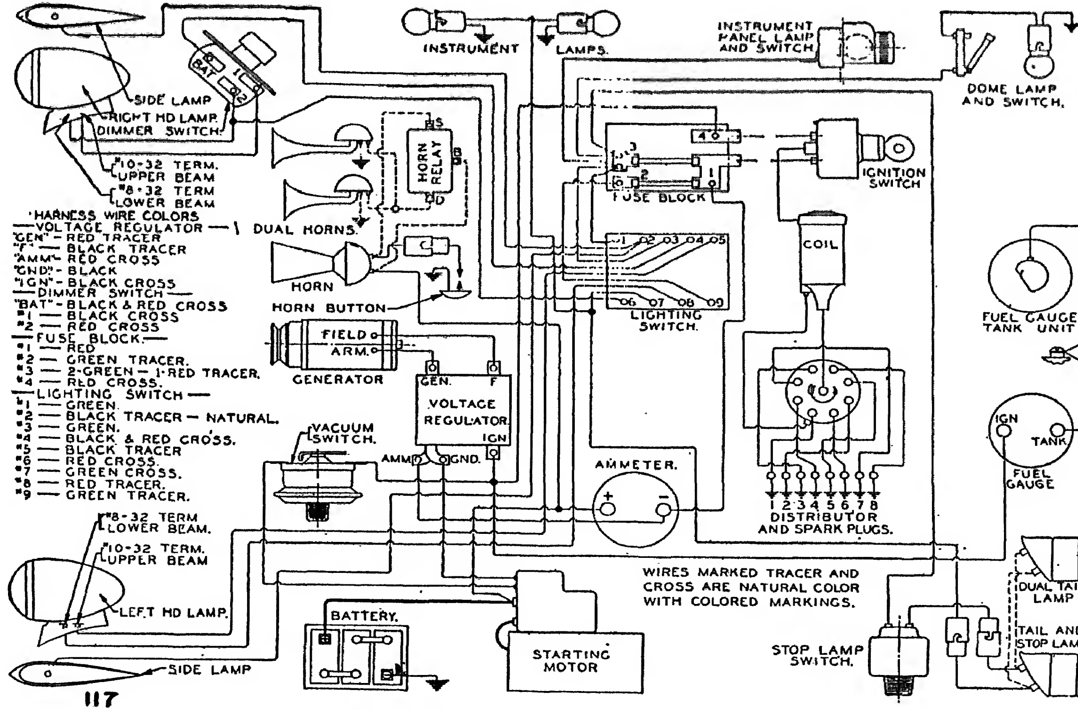
Clutch Own **Facings** Moulded 6¼″ x 9⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 40 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Hydraulic Bendix
Front 25 15/16″ x 1¾″ x 3/16″ Clearance .010″
Rear 25 15/16″ x 1¾″ x 3/16″ Clearance .010″
Hand Rear Service
Lining Moulded

Diagram 116



PONTIAC WIRING DIAGRAM, 1935, MODEL 8-CYLINDER
Courtesy of Pontiac Motor Company

Pontiac **Model 8-Cylinder** **Year 1935**

Battery Delco-Remy **Type** **Volts** 6 **Amps.** 107

Frame Connection Negative

Lighting

Head Lights 6-8, 21-32 C.P.

Dash, Tail and Stop 6-8, 3-3-15 C.P.

Side Lights 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 18 Amps. **Speed** 40 M.P.H.

Regulation 3rd Brush **Cut-in** 6-7 Volts

Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .018″

Spark Plug—Size 14 M.M. **Gap** .025″

Firing Order 1-6-2-5-8-3-7-4

Timing 9° B.T.C. Retard

Engine **Bore** 3 3/16″ **Stroke** 3 1/2″ **Taxable H.P.** 32.52

Piston Ring—Width Oil 1—3/16″ Comp. 3—1/8″
Diam. 3 3/16″ **Gap** .007″ on All

Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.

Intake Clearance .009″

Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.

Exhaust Clearance .011″

Carburetor Carter WI-308-S

Steering Caster 20° Camber 0° Toe-in 1/32″

Cooling System Centrifugal **Type** Pump **Capacity** 3 7/8 Gals.

Clutch Own **Facings** Moulded 6 1/4″ x 9 7/8″ x 1/8″ 2 Required

Gear Ratio Ring Gear 41 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes **Front** 25 15/16″ x 1 3/4″ x 3/16″ Clearance .010″

Rear 25 15/16″ x 1 3/4″ x 3/16″ Clearance .010″

Hand Rear Service

Lining Moulded

Diagram 117

Pontiac **Model 603, 8-Cylinder** **Year 1934**

Battery Delco **Type** 17-GW **Volts** 6 **Amps.** 107
Frame Connection Negative

Lighting Mazda 2320-C **Head Lights** 6-8, 32-21 C.P.
Mazda 63 **Dash and Tail** 6-8, 3 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 13-15 Amps. **Speed** 3000 R.P.M.
Regulation 3rd Brush **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″
Spark Plug—Size 14 MM. **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing 9° B.T.C.

Engine **Bore** $3\frac{3}{16}$″ **Stroke** $3\frac{1}{2}$″ **Taxable H.P.** 32.52
Piston Ring—Width Oil 1—$\frac{3}{16}$″ Comp. 3—$\frac{1}{8}$″
Diam. $3\frac{3}{16}$″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance .009″ Hot
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .009″ Hot

Carburetor Carter WI

Steering Caster 0° Camber 2° Toe-in $\frac{1}{32}$

Cooling System Centrifugal **Type** Pump **Capacity** $3\frac{3}{4}$ Gals.

Clutch Own **Facings** Moulded $6\frac{1}{4}$″ x 10″ x $\frac{1}{8}$″ 2 Required

Gear Ratio Ring Gear 41 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Mechanical
Front 26″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″
Rear 26″ x $1\frac{3}{4}$″ x $\frac{3}{16}$″
Hand 4 Wheels
Lining Moulded

Pontiac **Model 8 Cylinder 601** **Year 1933**

Battery Delco **Type** 15-KW **Volts** 6 **Amps.** 94
Frame Connection Negative

Lighting Double Contact **Head Lights** 6-8, 32-21 C.P.
Single Contact **Dash & Tail** 6-8, 3 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 11-13 Amps. **Speed** 20
Regulation 3rd Brush **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .0125″-.0175″
Spark Plug—Size 14 M.M. **Gap** .018″-.023″
Firing Order—1-6-2-5-8-3-7-4
Timing 9° B.T.D.C. Auto Adv., Retard

Engine **Bore** 3-3/16″ **Stroke** 3-1/2″ **Taxable H.P.** 32.5
Piston Ring—Width 1-3/16″, 3-1/8″ **Diam.** 3-3/16″ **Gap All Rings** .007″
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance .009″ Hot
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .009″ Hot

Carburetor Carter W1

Cooling System Centrifugal **Type** Pump **Capacity** 3-3/4 Gals.

Clutch Own **Facing**—Moulded 10″ x 6-1/4″ x 1/8″

Gear Ratio Ring Gear 40 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes **Front** 18-1/4″ x 1-3/4″ x 3/16″
Own
Mechanical { **Rear** 18-1/4″ x 1-3/4″ x 3/16″
Hand All 4 Wheels
Lining—Moulded

Reo **Model Flying Cloud S-6** **Year 1934**

Battery	Willard	**Type** WH-1-13	**Volts** 6	**Amps.** 102
		Frame Connection	Negative	
Lighting	Mazda 1116	**Head Lights**	6-8, 32-21 C.P.	
	Mazda 63, 87	**Dash, Tail and Stop**	6-8, 3-3-21 C.P.	
	Mazda 63	**Side Lights**	6-8, 3 C.P.	

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 9-12 Amps. **Speed** 1800-2000 R.P.M.
Regulation 3rd Brush **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 18 MM. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 8½° or 3 Teeth B.T.C.

Engine **Bore** 3⅜″ **Stroke** 5″ **Taxable H.P.** 27.3
Piston Ring—Width Oil 1—5/32″, 1—3/16″ Comp. 2—3/32″
Diam. 3⅜″ **Gap** .007″ on All
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 50° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 48° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Stromberg

Steering Caster 3½° Camber 1½° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 5 Gals.

Clutch Long **Facings** Moulded 6¼″ x 9¾″ x 5/16″ 2 Required

Gear Ratio Ring Gear 43 Pinion 10 Spiral Gears

Axle Own Semi-Floating

Brakes Lockheed Hydraulic
Front 24″ x 1¾″ x .17″ Clearance Heel .010″ Toe .012″
Rear 24″ x 1¾″ x .17″ Clearance Heel .010″ Toe .012″
Hand Transmission 20½″ x 2½″ x 3/16″ Clearance 1/32″

Lining Moulded

Reo	Model 8-N-2	Year 1933		

Battery Willard **Type** RH-4-17 **Volts** 6 **Amps.** 137
Frame Connection Negative

Lighting Double Contact **Head Lights** 6-8, 21-21 C.P.
Single Contact **Dash & Tail** 6-8, 3 C.P. **Stop** 15 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 9-12 Amps. **Speed** 1800-2000 R.P.M.
Regulation 3rd Brush, Thermo. **Cut-in** 6.75-7.5 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order—1-6-2-5-8-3-7-4
Timing 3/4″ Flywheel B.T.D.C. Manual Full Adv.

Engine **Bore** 3-3/8″ **Stroke** 5″ **Taxable H.P.** 36.48
Piston Ring—Width 1-3/16″, 3-1/8″ **Diam.** 3-3/8″ **Gap** Oil Ring .005″ Comp.Ring.007″
Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** At T.D.C. **Close** 50° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 48° B.B.C. **Close** 2° A.T.C
Exhaust Clearance .008″ Hot

Carburetor Schebler S

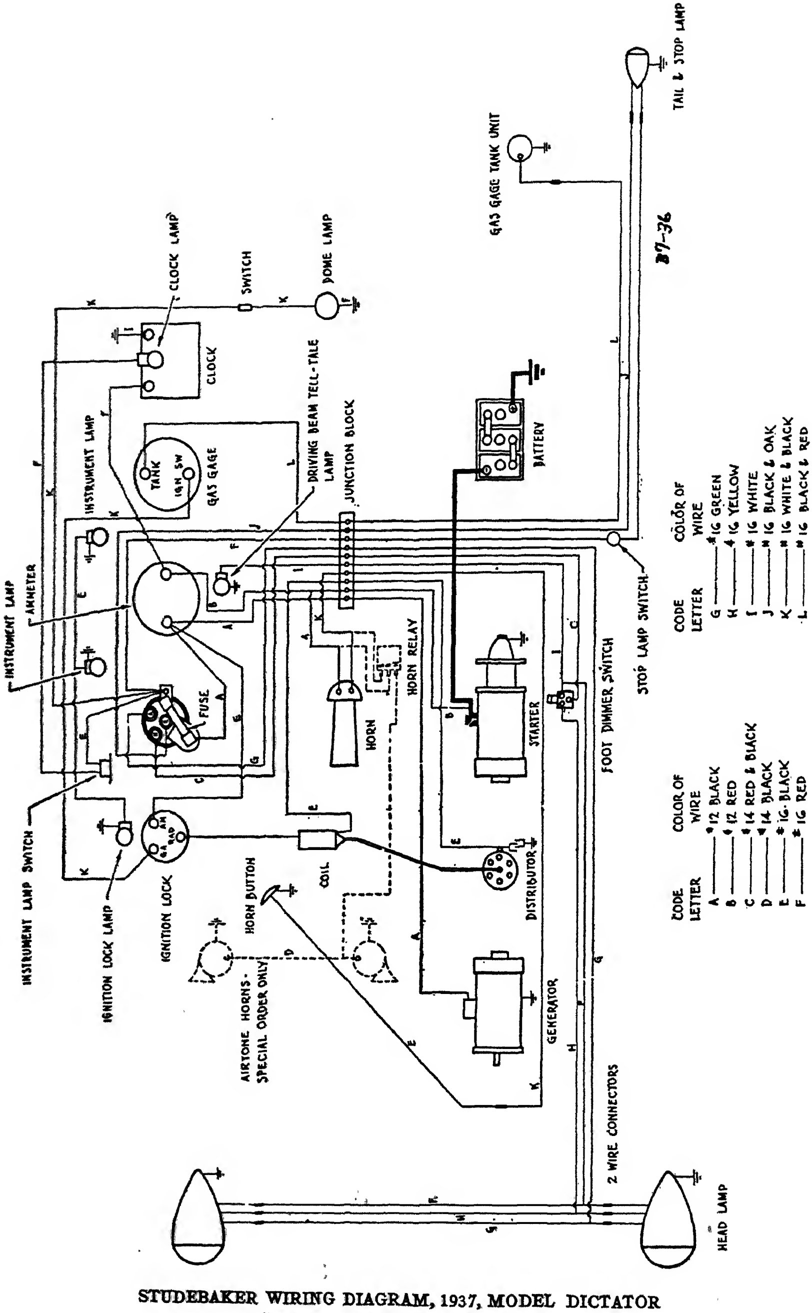
Cooling System Centrifugal **Type** Pump **Capacity** 5-3/4 Gals.

Clutch Long **Facing**—Moulded 9-3/4″ x 6-1/4″ x .130″

Gear Ratio Ring Gear 53 Pinion 18 Spiral Gears

Axle Own Semi-Floating

				Heel	Toe
Brakes Lockheed Hydraulic	**Front**	31-1/8″ x 2-1/4″ x .192″	Clearance	.006″	.010″
	Rear	31-1/8″ x 2-1/4″ x .192″	Clearance	.006″	.010″
	Hand	Trans. 20-1/2″ x 2-1/2″ x 3/16″	Clearance 1/32″		
	Lining—Moulded				



STUDEBAKER WIRING DIAGRAM, 1937, MODEL DICTATOR

Courtesy of Studebaker Corporation

Studebaker Model Dictator Year 1937

Battery Willard **Type** **Volts** 6-8 **Amps.** 105
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P.
Mazda 1158 **Stop Light** 6-8, 21 C.P. **Tail** 6-8, 2 C.P.
Mazda 55 **Parking Lights** 6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 14.5 Amps. Hot **Speed** 2200 R.P.M., Arm.
Regulation **Cut-in** 7 Volts, 760 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 18 M.M. **Gap** .022″
Firing Order 1-5-3-6-2-4
Timing 2° B.T.C.

Engine **Bore** 3¼″ **Stroke** 4⅜″ **Taxable H.P.** 25.40
Piston Ring—Width Oil 1—³⁄₁₆″ Comp. 2—⅛″
Diam. 3¼″ **Gap** Oil .013″ Comp. .013″
Oiling—Type Gear Pump **Capacity** 5½ Qts.
Pressure 40 Lbs. @ 25 M.P.H.

Valves **Intake Timing—Open** 15° B.T.C. **Close** 49° A.B.C.
Intake Clearance Cold .016″ Operating, .020″ Timing
Exhaust Timing—Open 54° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance Cold .016″ Operating, .020″ Timing

Carburetor Stromberg EX23

Steering Caster 1½° Camber 1½° Toe-in ¹⁄₁₆″

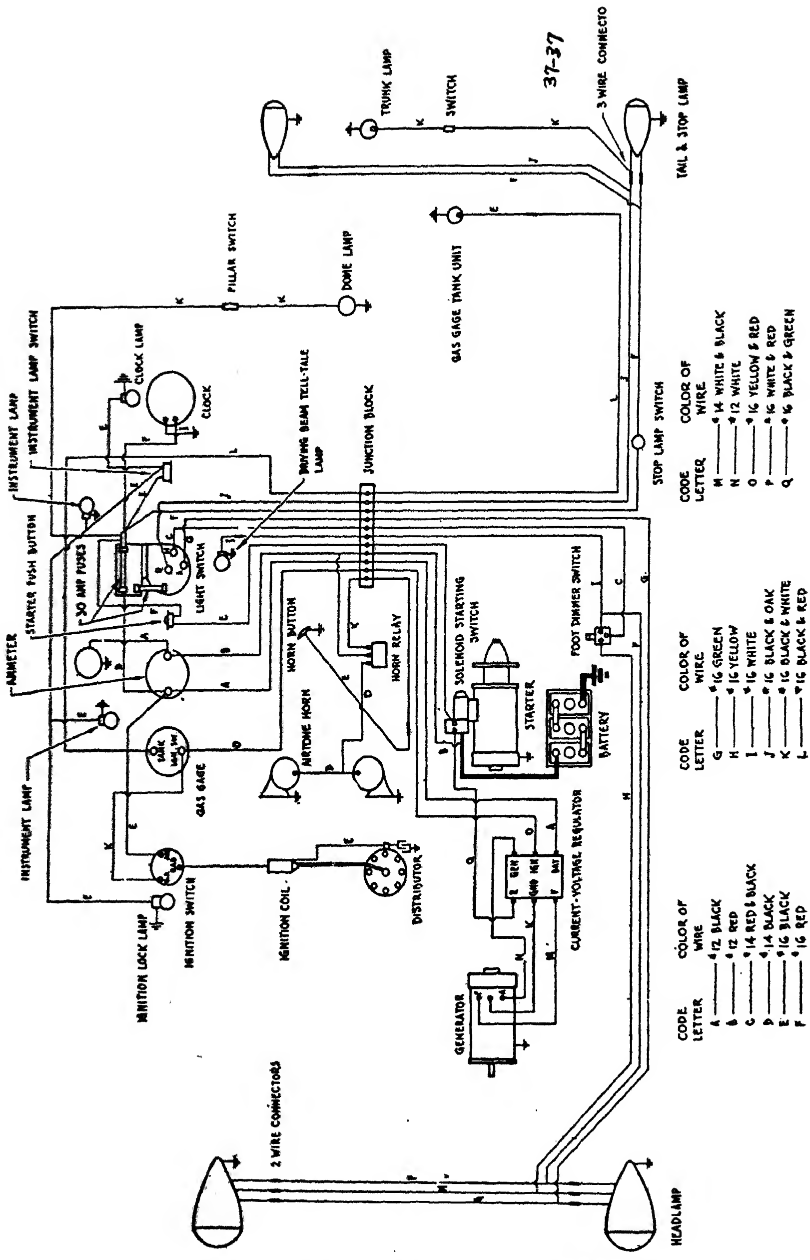
Cooling System Centrifugal **Type** Pump, Belt **Capacity** 13 Qts.

Clutch Borg & Beck **Facings** Moulded and Woven 5⅝″ x 9¼″ x .133″ 2 Required

Gear Ratio Ring Gear 50 Pinion 11 Hypoid Gears

Axle Spicer Semi-Floating

Brakes Lockheed Hydraulic
Front 19¹¹⁄₁₆″ x 1¾″ x ³⁄₁₆″
Rear 19¹¹⁄₁₆″ x 1¾″ x ³⁄₁₆″
Hand Rear Service
Lining Woven and Semi-Moulded **Diagram** 37-36



STUDEBAKER WIRING DIAGRAM, 1937, MODEL PRESIDENT

Courtesy of Studebaker Corporation

Studebaker **Model President** **Year 1937**

Battery Willard **Type** **Volts** 6-8 **Amps.** 105
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P.
Mazda 1158 **Stop Light** 6-8, 21 C.P. **Tail** 6-8, 2 C.P.
Mazda 55 **Parking Lights** 6-8, 1½ C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 25 Amps. Hot **Speed** 1650 R.P.M., Arm.
Regulation Voltage and Current **Cut-in** 6.5 Volts, 700 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Delco-Remy
Contact Breaker Gap .020″
Spark Plug—Size 18 M.M. **Gap** .022″
Firing Order 1-6-2-5-8-3-7-4
Timing T.D.C.

Engine **Bore** 3$\frac{1}{16}$″ **Stroke** 4¼″ **Taxable H.P.** 30.00
Piston Ring—Width Oil 1—$\frac{3}{16}$″ Comp. 2—⅛″
Diam. 3$\frac{1}{16}$″ **Gap** Oil .013″ Comp. .013″
Oiling—Type Gear Pump **Capacity** 8 Qts.
Pressure 40 Lbs. @ 25 M.P.H.

Valves **Intake Timing—Open** 15° B.T.C. **Close** 49° A.B.C.
Intake Clearance Cold .016″ Operating, .020″ Timing
Exhaust Timing—Open 54° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance Cold .016″ Operating, .020″ Timing

Carburetor Stromberg EE1

Steering Caster–¼° Camber ½° Toe-in $\frac{1}{16}$″

Cooling System Centrifugal **Type** Pump, Belt **Capacity**

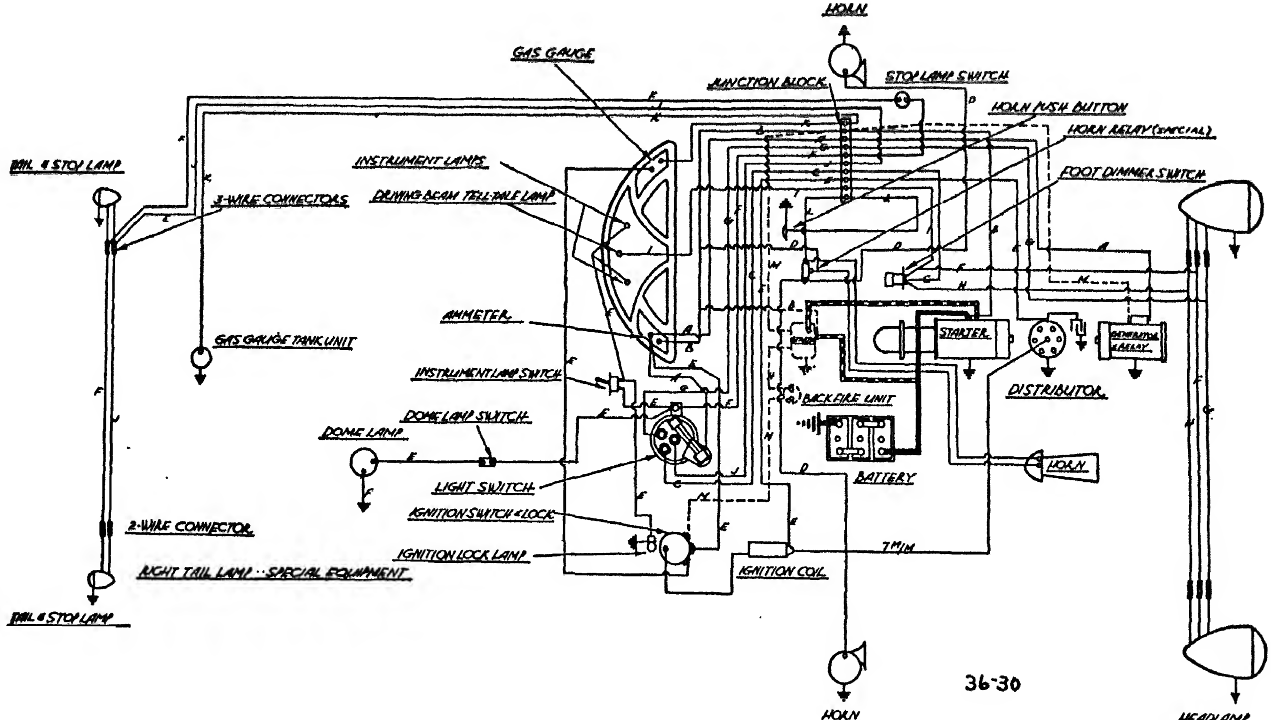
Clutch Long **Facings** Moulded 6″x10″x.137″ 2 Required

Gear Ratio Ring Gear 50 Pinion 11 Hypoid Gears

Axle Spicer Semi-Floating

Brakes Lockheed Hydraulic
Front 21½″ x 1¾″ x ¼″
Rear 21½″ x 1¾″ x ¼″
Hand Rear Service

Lining Woven and Semi-Moulded **Diagram** 37-37



STUDEBAKER WIRING DIAGRAM, 1936, MODEL, DICTATOR

Courtesy of Studebaker Corporation

Studebaker **Model Dictator** **Year 1936**

Battery Willard **Type** WH-1-13 **Volts** 6 **Amps.** 102
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P
Stop Light 6-8, 21 C.P. **Tail** 6-8, 2 C.P.
Parking Lights 6-8, 1½ C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite — **Max. Chg. Rate** 17 Amps. Hot — **Speed** 20.6 M.P.H.
Regulation 3rd Brush and Voltage Control — **Cut-in** 6.4 Volts
Contact Gap

Ignition Auto-Lite — **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 3/64″ B.T.C.

Engine **Bore** 3¼″ **Stroke** 4⅜″ **Taxable H.P.** 25.4
Piston Ring—Width Oil 1—3/16″ **Comp.** 2—⅛″
Diam. 3¼″ **Gap** .013″-.018″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 15° B.T.C. **Close** 49° A.B.C.
Intake Clearance .020″
Exhaust Timing—Open 54° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .020″

Carburetor Stromberg EX2

Steering Caster 1° Camber 1° Toe-in 1/16″ to ⅛″

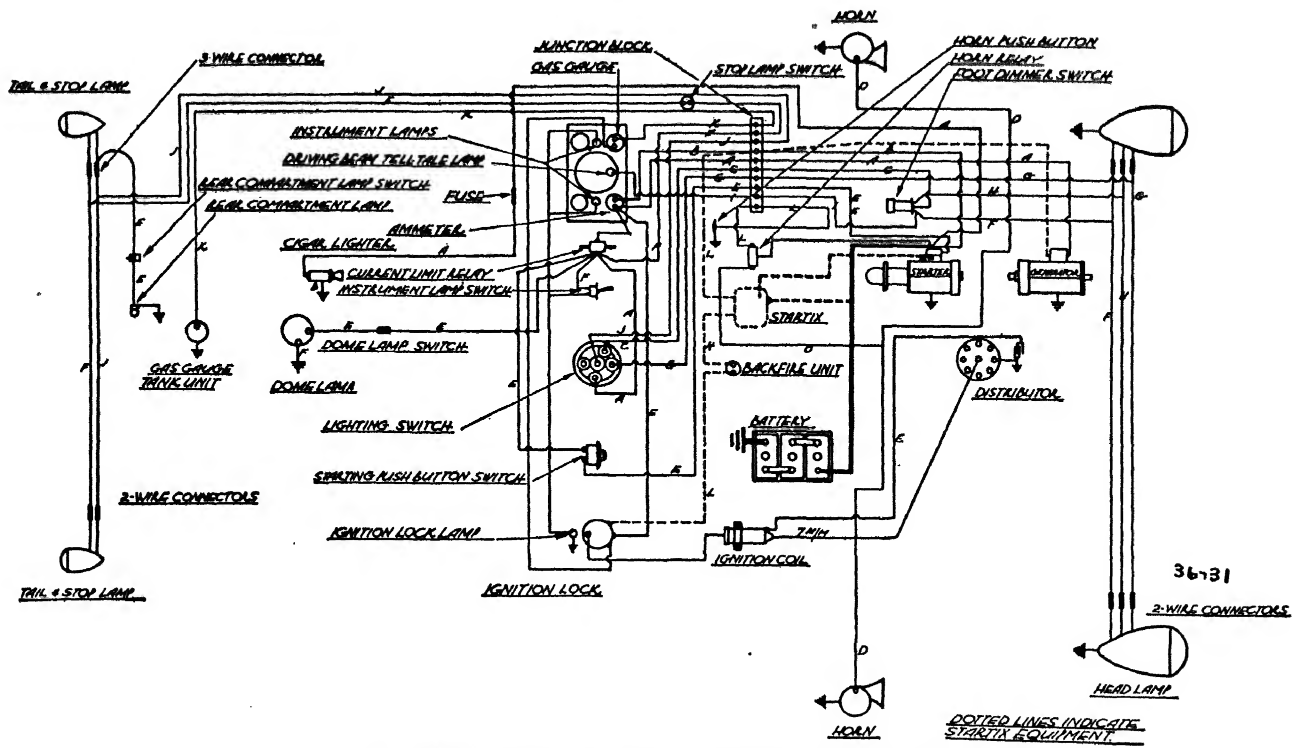
Cooling System Centrifugal **Type** Pump **Capacity** 14 Qts.

Clutch Borg & Beck **Facings** Moulded and Woven 5⅝″ x 9¼″ x .133″ 2 Required

Gear Ratio 4.55 to 1 Spiral Gears

Axle Semi-Floating

Brakes Lockheed Hydraulic
Front 23″ x 1¾″ x ¼″ Clearance Heel .005″ Toe .010″
Rear 23″ x 1¾″ x ¼″ Clearance Heel .005″ Toe .010″
Hand Rear Service
Lining Woven **Diagram** 36-30



STUDEBAKER WIRING DIAGRAM, 1936, MODEL, PRESIDENT

Courtesy of Studebaker Corporation

Studebaker **Model President** **Year 1936**

Battery Willard **Type** WH-1-13 **Volts** 6 **Amps.** 102
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6-8, 2 C.P.
Parking Lights 6-8, 1½ C.P.

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 17 Amps. Hot **Speed** 37 M.P.H.
Regulation 3rd Brush and Voltage Control **Cut-in** 6.4 Volts
Contact Gap

Ignition Delco-Remy
Contact Breaker Gap .018"-.024"
Spark Plug—Size 18 M.M. **Gap** .025"
Firing Order 1-6-2-5-8-3-7-4
Timing Upper Dead Center

Engine **Bore** 3$\frac{1}{16}$" **Stroke** 4¼" **Taxable H.P.** 30
Piston Ring—Width Oil 1—$\frac{3}{16}$" Comp. 2—⅛"
Diam. 3$\frac{1}{16}$" **Gap** .013"-.018"
Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** 15° B.T.C. **Close** 49° A.B.C.
Intake Clearance .020"
Exhaust Timing—Open 54° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .020"

Carburetor Stromberg EE1

Steering Caster ¼° Camber 1½° Toe-in $\frac{3}{16}$"

Cooling System Centrifugal **Type** Pump **Capacity** 17 Qts.

Clutch Long **Facings** Moulded 6"x10"x.137" 2 Required

Gear Ratio 4.55 to 1 Spiral Gears

Axle Semi-Floating

Brakes Lockheed Hydraulic
Front 25" x 1¾" x ¼" Clearance Heel .005" Toe .010"
Rear 25" x 1¾" x ¼" Clearance Heel .005" Toe .010"
Hand Rear Service
Lining Woven **Diagram** 36-31

Studebaker Models Dictator 6 and Deluxe A Year 1934

Battery Willard **Type** WH-1-13 **Volts** 6 **Amps.** 102
Frame Connection Positive

Lighting Mazda 1000 **Head Lights** 6-8, 32-32 C.P.
Mazda 63, 1158 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Cold **Max. Chg. Rate** 16-18 Amps. **Speed** 2400 R.P.M.
Regulation 3rd Brush **Cut-in** 6.4 Volts
Relay Air Gap .010″-.030″ **Contact Gap** .025″-.035″

Contact Breaker Gap .020″
Spark Plug—Size 18 MM. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Bore 3¼″ **Stroke** 4⅛″ **Taxable H.P.** 25.4
Piston Ring—Width Oil 1—3/16″ Comp. 3—⅛″
Diam. 3¼″ **Gap** .013″ on All
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 15° B.T.C. **Close** 43° A.B.C.
Intake Clearance .004″ Hot
Exhaust Timing—Open 48° B.B.C. **Close** 10 A.T.C.
Exhaust Clearance .006″

Carburetor Stromberg UR23

Steering Caster ½° Camber 1½° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump **Capacity** 4 Gals.

Clutch Borg & Beck **Facings** Moulded 5¾″ x 9″ x .133″ 2 Required

Gear Ratio Ring Gear 50 Pinion 11 Spiral Gears

Axle Spicer Semi-Floating

Brakes Midland Mechanical
- **Front** 29⅛″ x 1½″ x ¼″ Clearance .010″
- **Rear** 29⅛″ x 1½″ x ¼″ Clearance .010″
- **Hand** 4 Wheels

Lining Moulded

Studebaker Model C President Year 1934

Battery	Willard	**Type** WH-4-17	**Volts** 6	**Amps.** 160
		Frame Connection	Positive	

Lighting	Mazda 1000	**Head Lights**	6-8, 32-32 C.P.
	Mazda 63, 1158	**Dash, Tail and Stop**	6-8, 3-2-21 C.P.
	Mazda 63	**Side Lights**	6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator	Hot	**Max. Chg. Rate** 9-12 Amps.	**Speed** 1800-2000 R.P.M.
		Regulation 3rd Brush	**Cut-in** 6.4 Volts
		Relay Air Gap .012″-.017″	**Contact Gap** .015″-.025″
Ignition		**Contact Breaker Gap** .020″	
		Spark Plug—Size 18 MM.	**Gap** .025″
		Firing Order 1-6-2-5-8-3-7-4	
		Timing T.D.C.	

Engine **Bore** 3 1/16′ **Stroke** 4 1/4″ **Taxable H.P.** 30

Piston Ring—Width Oil 1—3/16″ Comp. 3—1/8″
Diam. 3 1/16″ **Gap** .013″

Oiling—Type Pump **Capacity** 6 1/2 Qts.

Valves	**Intake Timing—Open** 15 B.T.C.	**Close** 43° A.B.C.
	Intake Clearance .004″ Hot	
	Exhaust Timing—Open 48° B.B.C.	**Close** 10° A.T.C.
	Exhaust Clearance .006″ Hot	

Carburetor Stromberg EE22

Steering Caster 1/2° Camber 1° Toe-in 1/16″

Cooling System Centrifugal **Type** Pump **Capacity** 4 1/2 Gals.

Clutch Long **Facings** Moulded 5 1/2″ x 9 3/4″ x 9/64″ 2 Required

Gear Ratio Ring Gear 47 Pinion 10 Spiral Gears

Axle Spicer Semi-Floating

Brakes Bendix Mechanical	**Front**	28″ x 1 3/4″ x 1/4″	Clearance .010″
	Rear	28″ x 1 3/4″ x 1/4″	Clearance .010″
	Hand	4 Wheels	
	Lining	Moulded	

Studebaker Model 56 Year 1933

Battery Willard **Type** WH-1-13 **Volts** 6 **Amps.** 102
Frame Connection Positive

Lighting
Double Contact **Head Lights** 6-8, 21-21 C.P.
Single Contact **Dash & Tail** 6-8, 3 C.P. **Stop** 15 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 11-13 Amps. **Speed** 1750-1850 R.P.M
Regulation 3rd Brush **Cut-in** 6.4 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—**Size** 18 M.M. **Gap** .025″
Firing Order—1-4-2-6-3-5
Timing At T.D.C. Manual Control Full Adv.

Engine **Bore** 3-1/4″ **Stroke** 4-5/8″ **Taxable H.P.** 25.40
Piston Ring—**Width** 1-3/16″, 3-1/8″ **Diam.** 3-1/4″ **Gap** All Rings .013″
Oiling—**Type** Pump **Capacity** 7 Qts.

Valves **Intake Timing**—**Open** 5° A.T.C. **Close** 53° A.B.C.
Intake Clearance .004″
Exhaust Timing—**Open** 38° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .006″

Carburetor Stromberg EX22

Cooling System Centrifugal **Type** Pump **Capacity** 3-1/2 Gal.

Clutch Long **Facing**—Moulded 9-1/4″ x 5-1/2″ x 9/64″

Gear Ratio Ring Gear 48 Pinion 11 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Mechanical
Front 26-3/16″ x 1-1/2″ x 1/4″ Clearance .008″
Rear 26-3/16″ x 1-1/2″ x 1/4″ Clearance .008″
Hand All 4 Wheels
Lining—Moulded

Studebaker **Model 73 and 82** **Year 1933**

Battery Willard **Type** WH-1-13 **Volts** 6 **Amps.** 102
Frame Connection Positive

Lighting Double Contact **Head Lights** 6-8, 21-21 C.P.
Single Contact **Dash & Tail** 6-8, 3 C.P. **Stop** 15 C.P.
Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 9-12 Amps. **Speed** 1800-2000 R.P.M.
Regulation 3rd Brush, Thermo. **Cut-in** 6.4 Volts
Relay Air Gap .012″-.017″ **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 18 M.M. **Gap** .025
Firing Order—1-6-2-5-8-3-7-4
Timing 4° B.T.C. Manual Control Full Adv.

Engine **Bore** 3-1/16″ **Stroke** 4″ **Taxable H.P.** 30.0
Piston Ring—Width 1-3/16″, 3-1/8″ **Diam.** 3-1/16″ **Gap** All Rings .013″
Oiling—Type Pump **Capacity** 6-1/2 Qts.

Valves **Intake Timing—Open** 15° B.T.C. **Close** 43″ A.B.C.
Intake Clearance .004″
Exhaust Timing—Open 48° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .006″

Carburetor Stromberg EE22

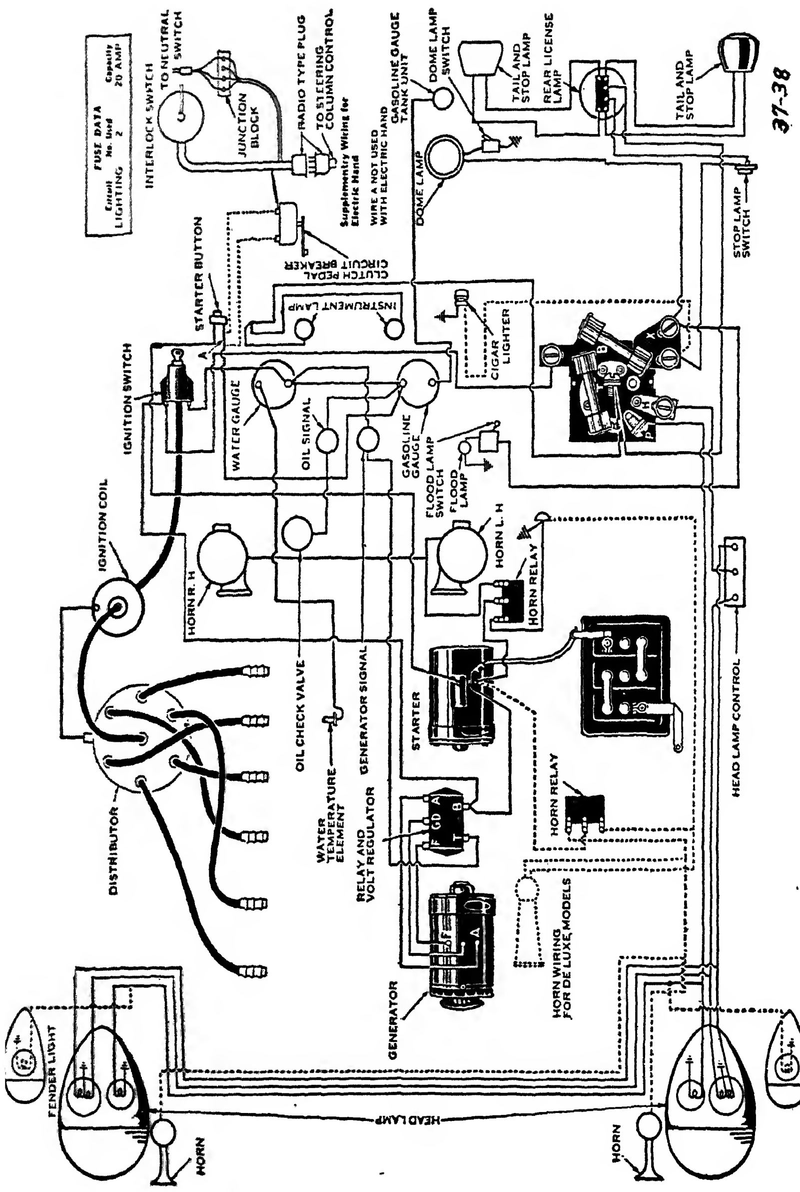
Cooling System Centrifugal **Type** Pump **Capacity** 4 Gals.

Clutch Long **Facing**—Moulded 9-1/4″ x 5-1/2″ x 9/64″

Gear Ratio Ring Gear 48 Pinion Gear 11 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Mechanical
Front 26-3/16″ x 1-1/2″ x 1/4″ Clearance .008″
Rear 26-3/16″ x 1-1/2″ x 1/4″ Clearance .008″
Hand All 4 Wheels
Lining—Moulded



TERRAPLANE WIRING DIAGRAM, 1937, 6-CYLINDER

Courtesy of Hudson Motor Car Company

Terraplane Model 6-Cylinder Year 1937

Battery National **Type** **Volts** 6-8 **Amps.** 105

Frame Connection Positive

Lighting Mazda 2331 D.C. **Head Lights** 6-8, 32-32 C.P.

Mazda 1158 **Stop Light** 6-8 Volts **Tail** 6-8, 3-21 C.P., D.C.

Mazda 55 **Parking Lights** 6-8, 1 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite — **Max. Chg. Rate** 12.5 Amps. Hot **Speed** 2400 R.P.M., Arm.

Regulation Voltage and Current **Cut-in** 7 Volts, 900 R.P.M.

Relay Air Gap **Contact Gap**

Ignition Auto-Lite — **Contact Breaker Gap** .020″

Spark Plug—Size 14 M.M. **Gap** .022″

Firing Order 1-5-3-6-2-4

Timing T.D.C.

Engine **Bore** 3″ **Stroke** 5″ **Taxable H.P.** 21.60

Piston Ring—Width Oil 2—3/16″ Comp. 3—3/32″

Diam. 3″ **Gap** Oil .009″ Comp. .009″

Oiling—Type Pressure **Capacity** 5 Qts. **Pressure** 3 Lbs. Max.

Valves **Intake Timing—Open** 10½° B.T.C. **Close** 60° A.B.C.

Intake Clearance Hot .008″

Exhaust Timing—Open 50° B.B.C. **Close** 18° A.T.C.

Exhaust Clearance Hot .010″

Carburetor Carter 348S

Steering Caster 0° Camber 1° Toe-in 0″

Cooling System Centrifugal **Type** Pump, Belt **Capacity** 13 Qts.

Clutch Own **Facings** Cork 5⅜″ x 8⅝″ x .203″

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

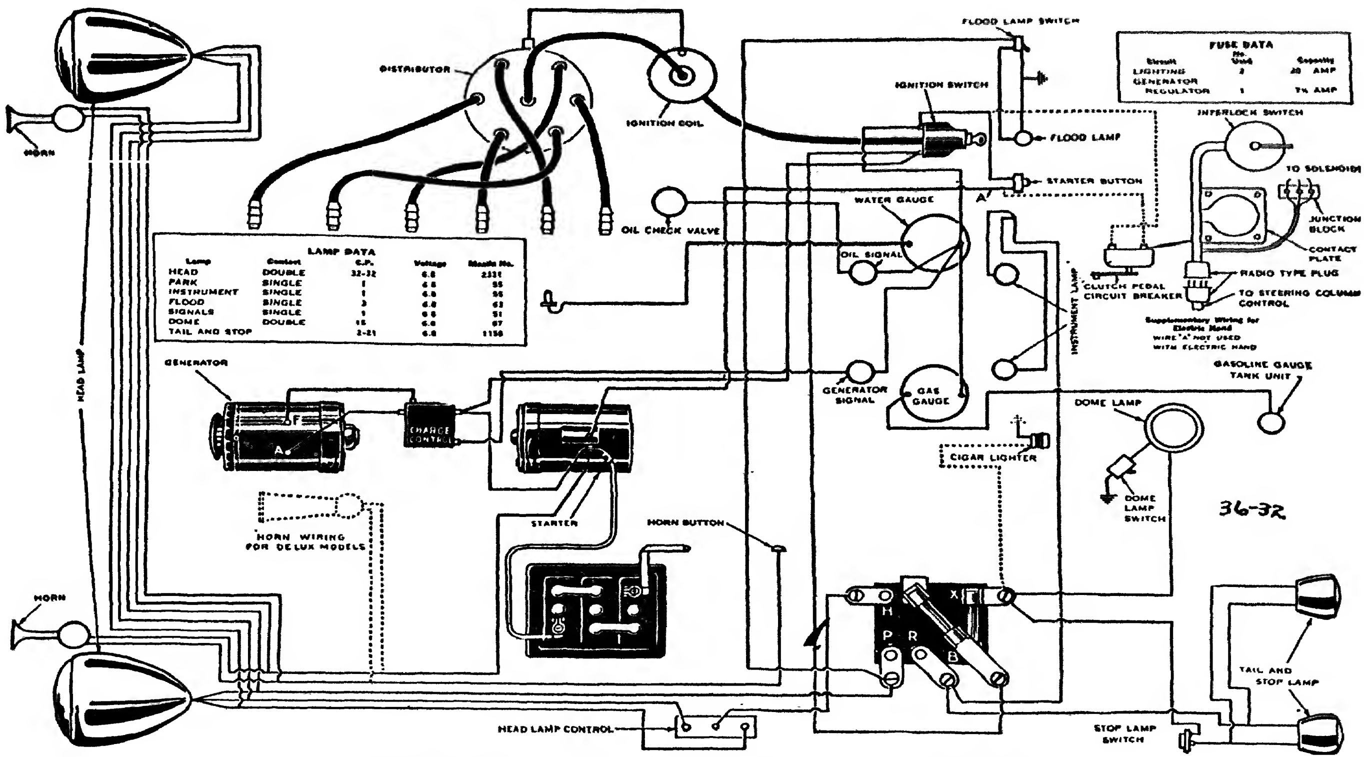
Axle Own Semi-Floating

Brakes Bendix Mechanical — **Front** 22⅛″ x 1¾″ x 7/32″ Clearance .010″

Rear 22⅛″ x 1¾″ x 7/32″ Clearance .010″

Hand Rear Service

Lining Moulded **Diagram** 37-38



LAMP DATA

Lamp	Contact	C.P.	Voltage	Mazda No.
HEAD	DOUBLE	32-32	6.8	2331
PARK	SINGLE	1	6.8	55
INSTRUMENT	SINGLE	1	6.8	55
FLOOD	SINGLE	3	6.8	63
SIGNALS	SINGLE	1	6.8	51
DOME	DOUBLE	15	6.8	87
TAIL AND STOP		3-21	6.8	1158

FUSE DATA

Circuit	No. Used	Capacity
LIGHTING	2	20 AMP
GENERATOR REGULATOR	1	7½ AMP

TERRAPLANE WIRING DIAGRAM, 1936, MODEL, 6-CYLINDER

Courtesy of Hudson Motor Car Company

Terraplane **Model 6-Cylinder** **Year 1936**

Battery National **Type** **Volts** 6 **Amps.** 120
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 6-8, 32-32 C.P.
Stop Light 6-8, 21 C.P. **Tail** 6-8, 2 C.P.
Parking Lights 6-8, 1 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite **Max. Chg. Rate** 13 Amps. Hot **Speed** 28 M.P.H.
Regulation 3rd Brush and Voltage Control **Cut-in** 7 Volts
Contact Gap

Ignition Auto-Lite **Contact Breaker Gap** .020″
Spark Plug—Size 14 M.M. **Gap** .022″
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Engine **Bore** 3″ **Stroke** 5″ **Taxable H.P.** 21.6
Piston Ring—Width Oil 2—3/16″ Comp. 2—3/32″
Diam. 3″ **Gap** .009″-.011″
Oiling—Type Plunger **Capacity** 6 Qts.

Valves **Intake Timing—Open** 11° B.T.C. **Close** 60° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 50° B.B.C. **Close** 19° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Carter

Steering Caster 2° to 2½° Camber 1° to 1½° Toe-in ⅛″

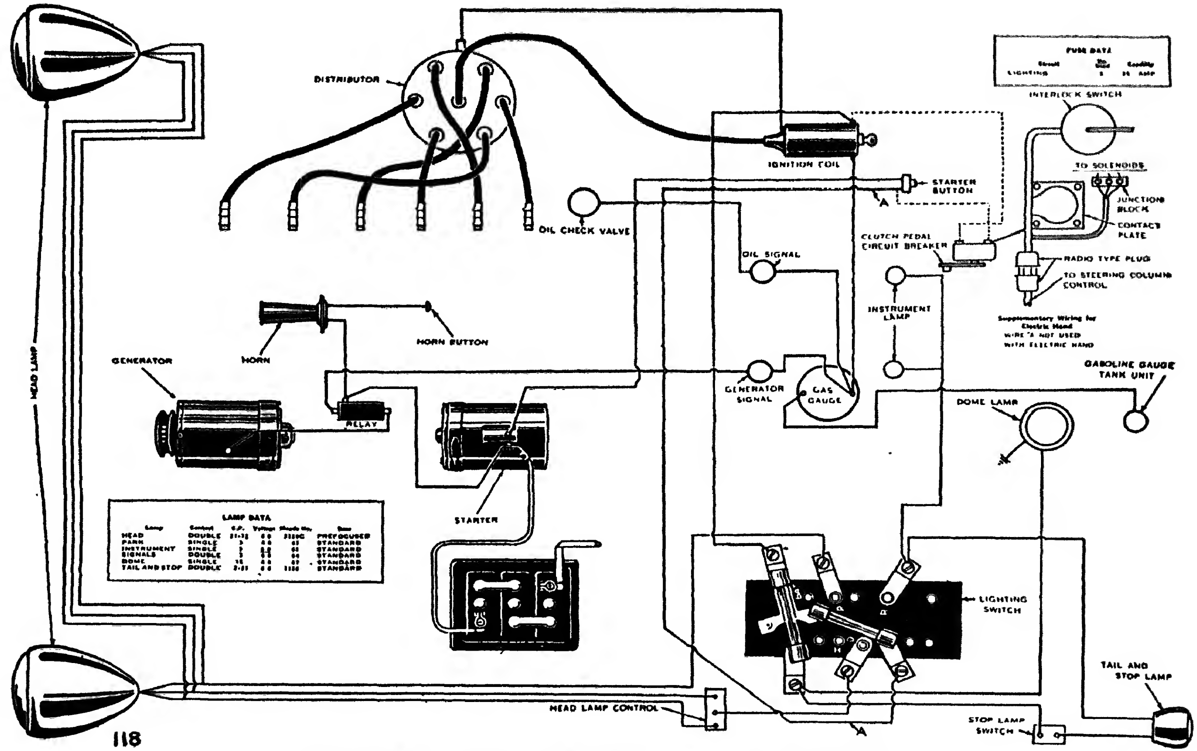
Cooling System Centrifugal **Type** Pump **Capacity** 3¼ Gals.

Clutch Own **Facings** Single Disc in Oil 5⅜″ x 8⅝″ x .203″ Cork

Gear Ratio 4.11 to 1 Spiral Gears

Axle Semi-Floating

Brakes Bendix Hydraulic **Front** 22⅛″ x 1¾″ x 7/32″ Clearance .010″
Rear 22⅛″ x 1¾″ x 7/32″ Clearance .010″
Hand Rear Service
Lining Moulded and Woven Diagram 36-32



TERRAPLANE WIRING DIAGRAM, 1935, MODEL SPECIAL 6

Courtesy of Hudson Motor Car Company

Terraplane **Model Special 6** **Year 1935**

Battery National **Type** **Volts** 6 **Amps.** 105
Frame Connection Positive

Lighting Mazda 2320-C **Head Lights** 6-8, 21-32 C.P.
Mazda 64, 1158 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 13 Amps. **Speed** 2300 R.P.M. Armature
Regulation 3rd Brush **Cut-in** 6.4 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 14 M.M. **Gap** .022″
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Engine **Bore** 3″ **Stroke** 5″ **Taxable H.P.** 21.6
Piston Ring—Width Oil 2—3/16″ Comp. 2—3/16″ **Diam.** 3″ **Gap** .006″
Oiling—Type **Capacity**

Valves **Intake Timing—Open** 11° B.T.C. **Close** 60° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 50° B.B.C. **Close** 19° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Carter W1

Steering Caster 3¼° Camber 1° Toe-in ⅛″

Cooling System Centrifugal **Type** Pump **Capacity** 4½ Gals.

Clutch Own **Facings** Cork 5⅝″ x 8⅝″ x .203″

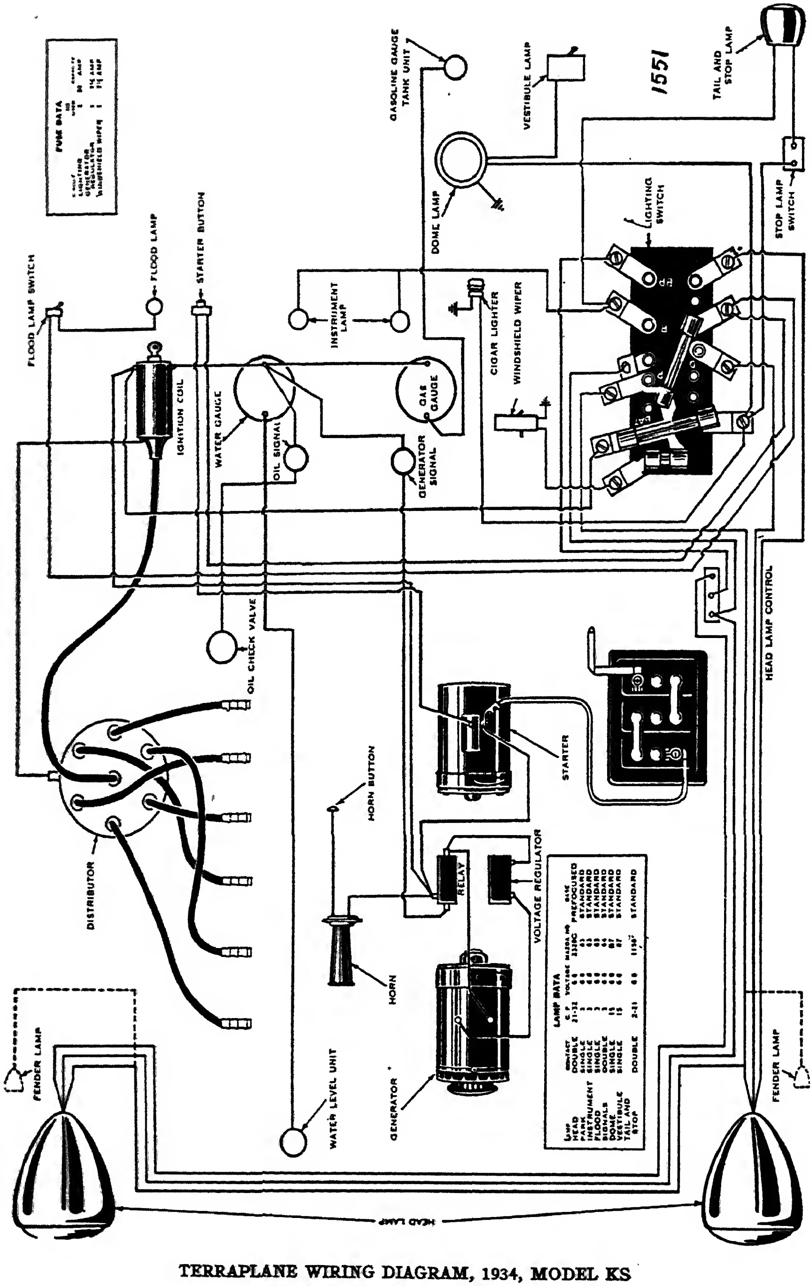
Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Mechanical Bendix
Front 19 3/16″ x 1¾″ x 3/16″ Clearance Toe .008″ Heel .014″
Rear 19 3/16″ x 1¾″ x 3/16″ Clearance Toe .008″ Heel .014″
Hand 4 Wheels

Lining Moulded

Diagram 118



TERRAPLANE WIRING DIAGRAM, 1934, MODEL KS

Courtesy of Hudson Motor Car Company

Terraplane **Model KS** **Year 1934**

Battery National **Type** ST-3-17X **Volts** 6 **Amps.** 100
Frame Connection Positive

Lighting Mazda 2320-C **Head Lights** 6-8, 32-21 C.P.
Mazda 63, 1158 **Dash, Tail and Stop** 6-8, 3-2-21 C.P.
Mazda 63 **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Cold **Max. Chg. Rate** 22 Amps. **Speed** 2200 R.P.M.
Regulation 3rd Brush **Cut-in** 6.4 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .020"
Spark Plug—Size 14 MM. **Gap** .022"
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Engine **Bore** 3" **Stroke** 5" **Taxable H.P.** 21.6
Piston Ring—Width Oil 1—1/8", 1—3/16" Comp. 2—3/32"
Diam. 3" **Gap** .006"
Oiling—Type Splash **Capacity** 6 Qts.

Valves **Intake Timing—Open** 11° B.T.C. **Close** 60° A.T.C.
Intake Clearance .006" Hot
Exhaust Timing—Open 50° B.B.C. **Close** 19° A.T.C.
Exhaust Clearance .008" Hot

Carburetor Carter W1

Steering Caster 1½° Camber 2° Toe-in 1/8"

Cooling System Centrifugal **Type** Pump **Capacity** 3 Gals.

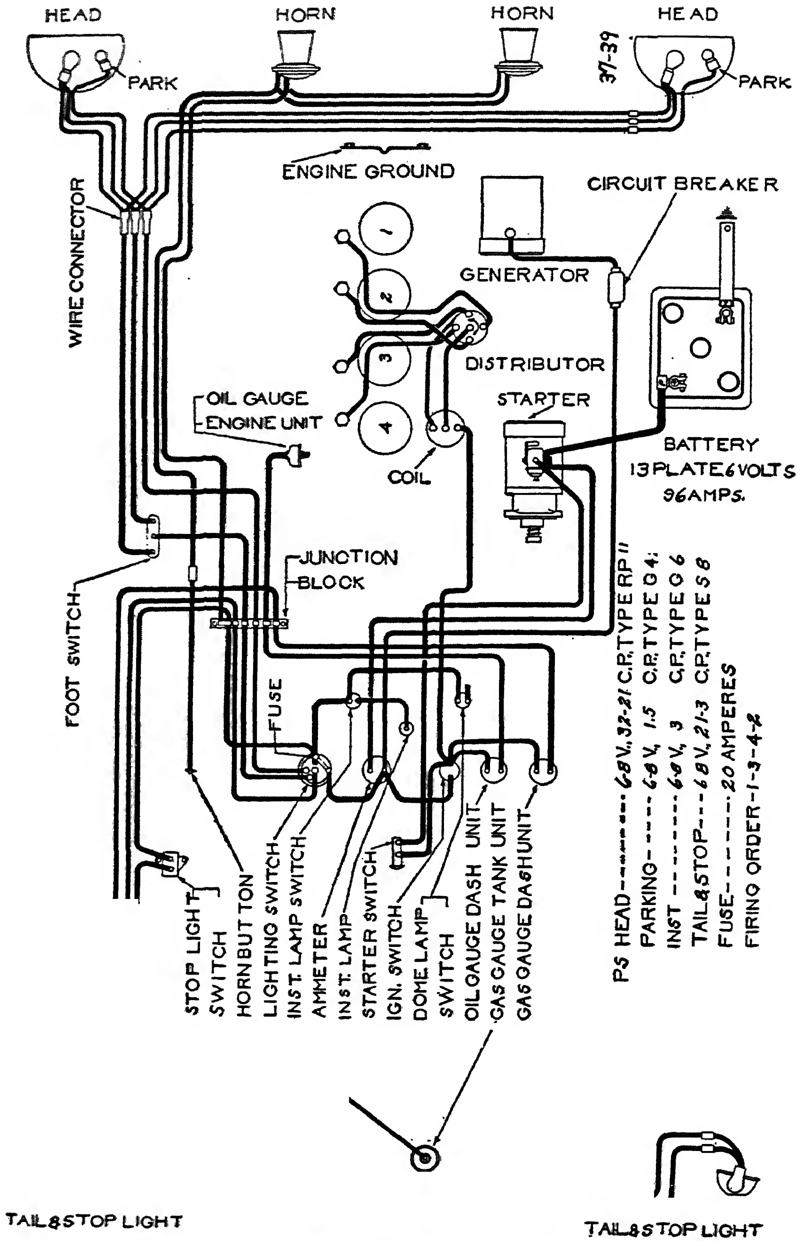
Clutch Own **Facings** Cork 5½" x 9" x .203" 9 Required

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Mechanical
Front 19 3/16" x 1¾" x 3/16" Clearance Heel .014" Toe .008"
Rear 19 3/16" x 1¾" x 3/16" Clearance Heel .014" Toe .008"
Hand 4 Wheels
Lining Moulded

Diagram 1551



WILLYS WIRING DIAGRAM, 1937, MODEL 37
Courtesy of Willys-Overland Incorporated

Willys Model 37 Year 1937

Battery U.S.L. **Type** **Volts** 6-8 **Amps.** 95
Frame Connection Negative

Lighting Type RP11 **Head Lights** 6-8, 32-21 C.P.
Type S8 **Stop Light** 6-8, 21 C.P. **Tail** 6-8, 3 C.P.
Type $G4\frac{1}{2}$ **Parking Lights** 6-8, 1.5 C.P.

Starter and Generator Auto-Lite

Generator Auto-Lite
Max. Chg. Rate 14 Amps. Hot **Speed** 2000 R.P.M., Arm.
Regulation **Cut-in** 7 Volts, 720 R.P.M.
Relay Air Gap **Contact Gap**

Ignition Auto-Lite
Contact Breaker Gap .020″
Spark Plug—Size 18 M.M. **Gap** .025″
Firing Order 1-3-4-2
Timing 5° A.T.C. Retard

Engine **Bore** $3\frac{1}{8}''$ **Stroke** $4\frac{3}{8}''$ **Taxable H.P.** 15.63
Piston Ring—Width Oil 1—$\frac{3}{16}''$ Comp. 2—$\frac{3}{32}''$
Diam. $3\frac{1}{8}''$ **Gap** Oil .007″ Comp. .007″
Oiling—Type Gear Pump **Capacity** 4 Qts.
Pressure 30 Lbs. @ 30 M.P.H.

Valves **Intake Timing—Open** T.D.C. **Close** 45° A.B.C.
Intake Clearance Hot .004″ Operating, .010″ Timing
Exhaust Timing—Open 40° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance Hot .006″ Operating, .010″ Timing

Carburetor Tillotson UIA

Steering Caster 3° Camber 2° Toe-in $\frac{3}{32}''$

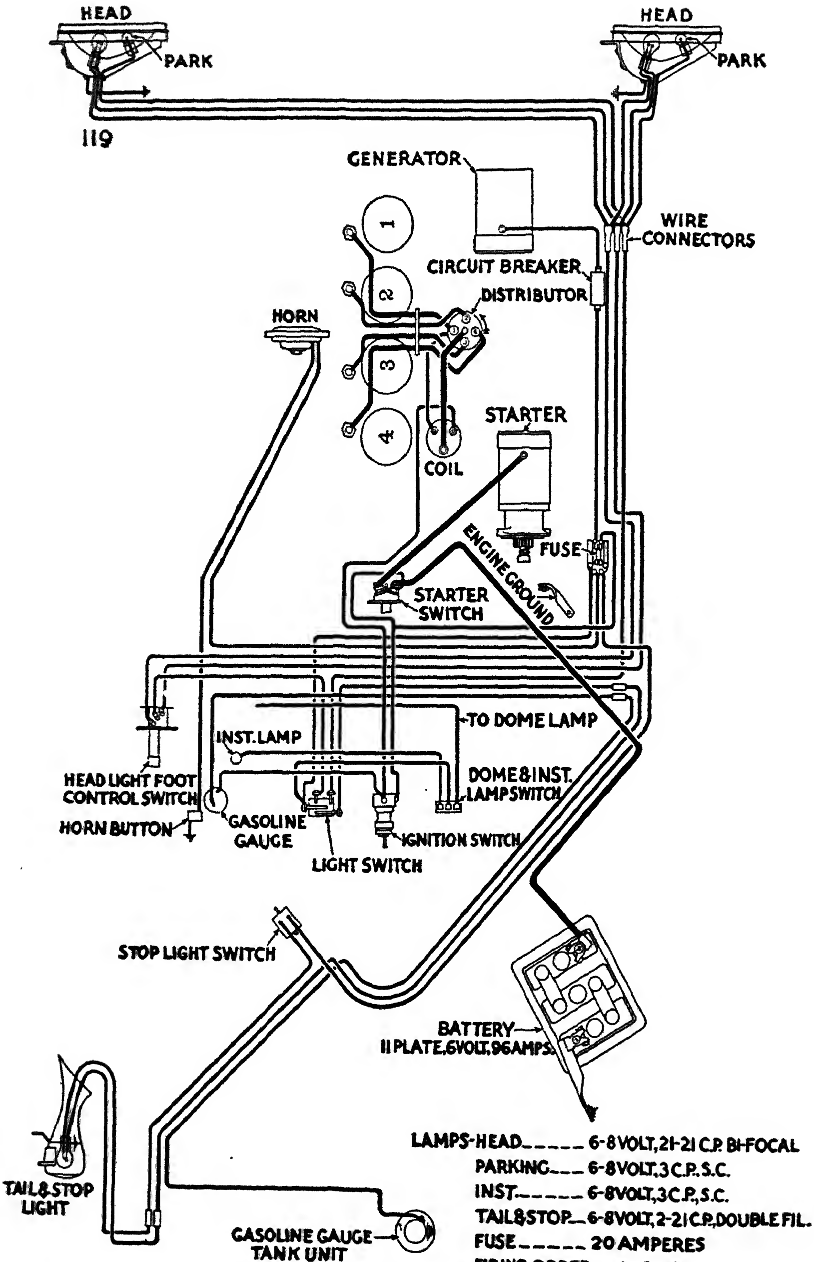
Cooling System Centrifugal **Type** Pump, Belt **Capacity** 11 Qts.

Clutch Borg & Beck **Facings** Moulded $5\frac{1}{8}'' \times 7\frac{7}{8}'' \times \frac{1}{8}''$ 2 Required

Gear Ratio Ring Gear 43 Pinion 10 Spiral Gears

Axle Own Semi-Floating

Brakes Bendix Mechanical
Front $19\frac{3}{16}'' \times 1\frac{3}{4}'' \times \frac{3}{16}''$ Clearance .010″
Rear $19\frac{3}{16}'' \times 1\frac{3}{4}'' \times \frac{3}{16}''$ Clearance .010″
Hand All Four Wheels
Lining Moulded Diagram 37-39



WILLYS WIRING DIAGRAM, 1935, MODEL 77

Courtesy of Willys-Overland Incorporated

Willys **Model 77** **Year 1935**

Battery U.S.L. **Type** **Volts** 6 **Amps.** 96

Frame Connection Negative

Lighting Mazda 1110 **Head Lights** 6-8, 21 C.P.

Dash, Tail and Stop 6-8, 3-2-21 C.P.

Single Contact **Side Lights** 6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 12 Amps. **Speed** 2350 R.P.M. Armature

Regulation 3rd Brush **Cut-in** 7.0 Volts

Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap**

Spark Plug—Size 18 M.M. **Gap** .027″

Firing Order 1-3-4-2

Timing 4° B.T.C. Retard

Engine **Bore** 3⅛″ **Stroke** 4⅜″ **Taxable H.P.** 15.6

Piston Ring—Width Oil 1—3/16″ Comp. 3—3/32″

Diam. 3⅛″ **Gap** .007″ on All

Oiling—Type Pump **Capacity** 4 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 45° A.B.C.

Intake Clearance .004″ Hot

Exhaust Timing—Open 40° B.B.C. **Close** 5° A.T.C.

Exhaust Clearance .006″ Hot

Carburetor Tillotson DIC

Steering Caster 1½° Camber 2° Toe-in 3/32″

Cooling System Centrifugal **Type** Pump **Capacity** 2¼ Gals.

Clutch Borg & Beck **Facings** Moulded 5⅛″ x 7⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 43 Pinion 10 Spiral Gears

Axle Own Semi-Floating

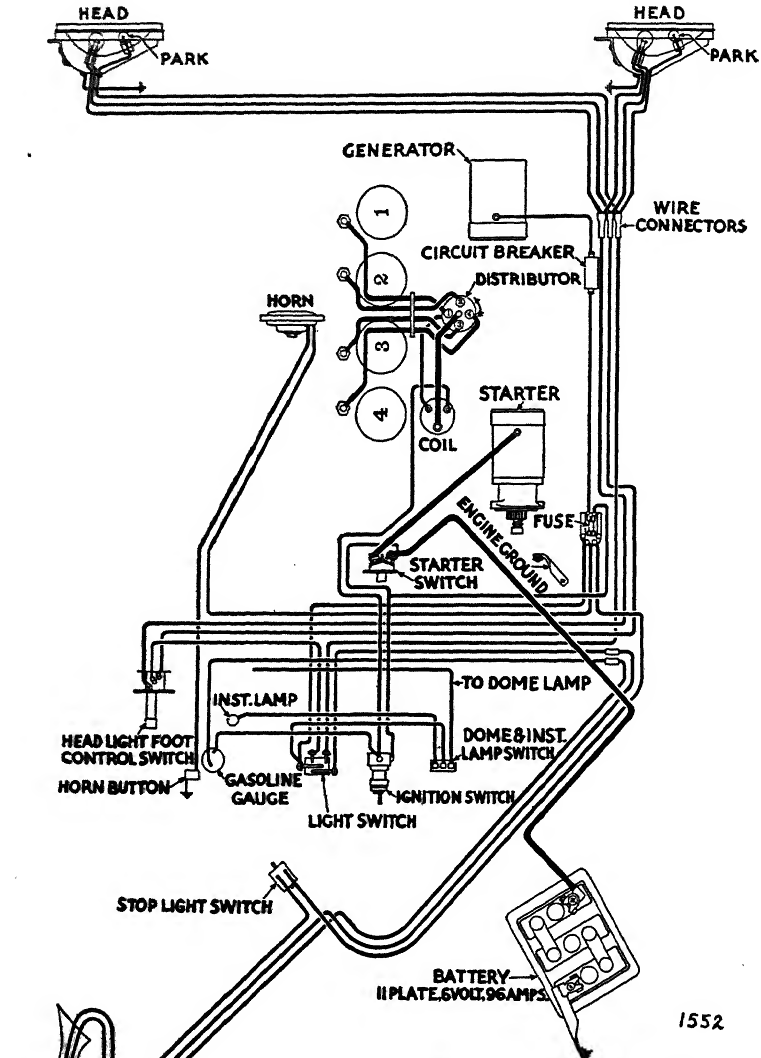
Brakes Mechanical Bendix **Front** 19 3/16″ x 1¾″ x 3/16″ **Clearance** .010″

Rear 19 3/16″ x 1¾″ x 3/16″ **Clearance** .010″

Hand 4 Wheels

Lining Moulded

Diagram 119



LAMPS-HEAD ------ 6-8 VOLT, 21-21 C.P. BI-FOCAL
PARKING ---- 6-8 VOLT, 3 C.P., S.C.
INST. ------ 6-8 VOLT, 3 C.P., S.C.
TAIL & STOP -- 6-8 VOLT, 2-21 C.P., DOUBLE FIL.
FUSE ------ 20 AMPERES
FIRING ORDER -- 1-3-4-2

WILLYS WIRING DIAGRAM, 1934, MODEL 77
Courtesy of Willys-Overland Incorporated

Willys — Model 77 — Year 1934

Battery U.S.L. **Type** CW-11A **Volts** 6 **Amps.** 84
Frame Connection Negative

Lighting

Mazda 1110	**Head Lights**	6-8, 21-21 C.P.
Mazda 63, 1158	**Dash, Tail and Stop**	6-8, 3-2-21 C.P.
Mazda 63	**Side Lights**	6-8, 3 C.P.

Starter and Generator Auto-Lite

Generator Cold **Max. Chg. Rate** 17 Amps. **Speed** 2375 R.P.M.
Regulation 3rd Brush **Cut-in** 7-7.5 Volts
Relay Air Gap .010"-.030" **Contact Gap** .025"-.035"

Ignition **Contact Breaker Gap** .018"
Spark Plug—Size 18 MM. **Gap** .025"
Firing Order 1-3-4-2
Timing 4° B.T.C.

Engine **Bore** 3⅛" **Stroke** 4⅜" **Taxable H.P.** 15.6
Piston Ring—Width Oil 1—3/16" Comp. 3—3/32"
Diam. 3⅛" **Gap** .007"
Oiling—Type Pump **Capacity** 4 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 45° A.B.C.
Intake Clearance .004" Hot
Exhaust Timing—Open 40° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .006" Hot

Carburetor Tillotson D-1A

Steering Caster 1°-2° Camber 2° Toe-in 3/32"

Cooling System Centrifugal **Type** Pump **Capacity** 9 Qts.

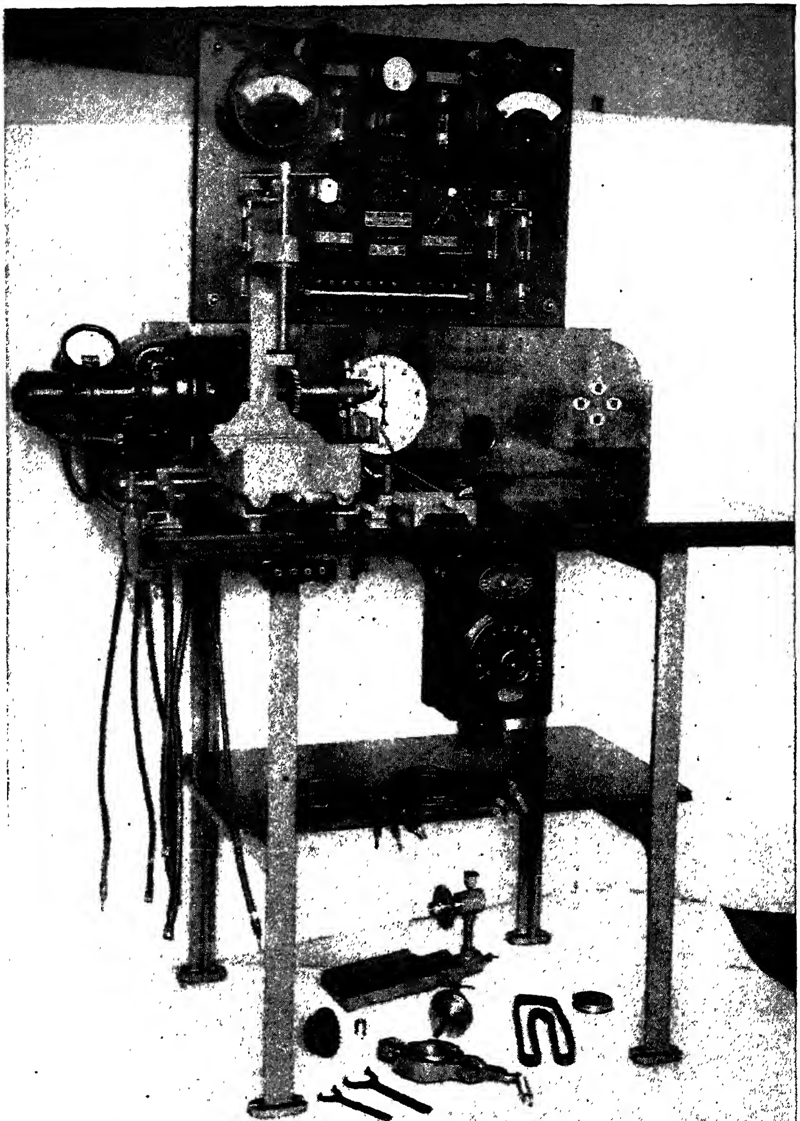
Clutch Own

Gear Ratio

Axle Own Semi-Floating

Brakes Bendix Mechanical
- **Front** 19 3/16" x 1¾" x 3/16" **Clearance** .010"
- **Rear** 19 3/16" x 1¾" x 3/16" **Clearance** .010"
- **Hand** 4 Wheels

Diagram 1552



WEIDENHOFF ELECTRICAL TEST BENCH COMPLETE

ELECTRICAL REPAIRS

TESTING AND REPAIR EQUIPMENT

The repair of electrical equipment is not often attempted by the ordinary garage repair man because he does not understand the methods of testing the different units or does not have the necessary equipment.

Every repair man should know how to test for trouble in connection with the electrical units and a knowledge of the different parts of the electrical equipment is essential if correct electrical repairs are to be made. If the principle upon which the different units operate is known, a test can readily be made. Of course, there are parts of the electrical system which need special tools and equipment, as in the case of armature repairs, but the simple tests should be made before the unit is sent out for repair in order to determine the cost of the repair.

The best type of equipment proves to be the most economical in the end, and it should be purchased from manufacturers who make a specialty of such equipment. Instruments, such as voltmeters and ampere meters, should always be purchased, and only the best instruments can be relied upon to give accurate readings. In the following pages some equipment is shown that is used for electrical tests. Some parts of this equipment can be made by a person who is handy with tools.

The simple lamp test outfit is the handiest type to use in making general tests. The set, Fig. 1, is for use with outside power, but a similar set can be made for use with the ordinary storage battery. The difference between the two sets is in the type of bulb used in the socket. A 6-volt lamp must be used in a car having a 6-volt battery, and a 12-volt lamp must be used with a 12-volt battery.

A service station or repair shop that can make repairs to electrical equipment will find that a great deal more business will come to the shop than if only mechanical repairs can be made. A repair

man who knows how to make accurate tests when hunting trouble in the electrical side of the automobile will find that his services will always be in demand and a study of the following pages on the equipment and methods used for electrical work will be very helpful to all who are interested in the automobile.

Take a porcelain base socket, screw it to a piece of board to form a base. Connect one side of this lamp socket to a standard

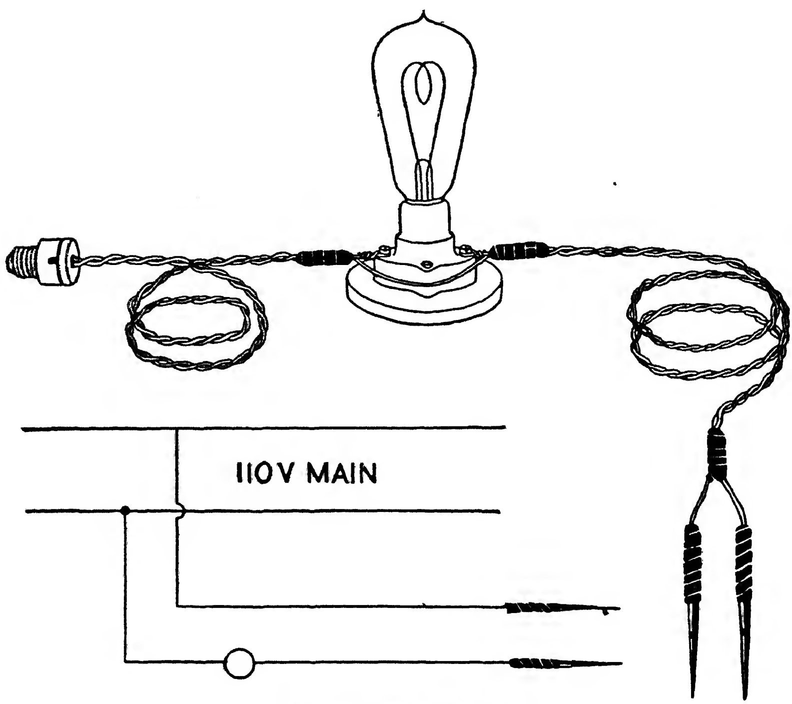


Fig. 1. Handy Testing Set

screw plug. Procure two pieces of brass or steel rod and file or grind them to a long tapering point. These rods should be about 6 inches long and tapering half their length to a sharp point. Connect the other side of the lamp socket to one of these points and connect the second point to the other terminal of the screw plug. Ordinary lamp cord can be used for the connections. For fastening to the test points it should be bared for several inches, wrapped solidly around the metal rods at their blunt ends, and

soldered fast in place. The joints should be heavily wrapped with tape or covered with other insulating material to form a handle, as shown in the illustration, Fig. 1. As shown by the diagram forming part of this illustration, it will be seen that the lamp is in series with one of the points, but that when the circuit is closed by bringing the two points together, the lamp is in multiple with the main circuit. The lamp should be of the carbon-filament type owing to its greater durability. As a lamp of this type of 16 c-p. only consumes a little over 50 watts at 110 volts, or approximately half an ampere of current, there is no danger of injuring any of the apparatus on the automobile through its use. Sufficient cord should be allowed on either side of the lamp to permit of connecting it up with the outlet conveniently.

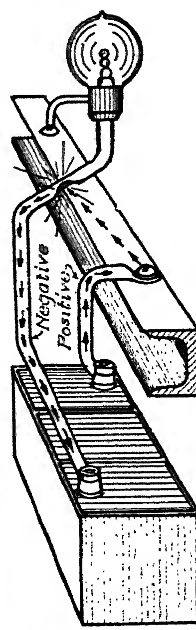


Fig. 2. Diagram of Ground or Short Circuit
Courtesy of Gray and Davis Company

In using this test outfit, the two test points are pressed on places between which no current should pass, and if the lamp lights it indicates that there is a ground between those points. For example, suppose there were a ground between the generator and the switch so that no current reached the latter, the lamp would not light when the test points were placed on terminals 1 and 7 of the diagram, the generator then being in operation. But a little searching along this circuit would soon show where it was grounded, thus making it easy to locate the break or ground. Fig. 2 is a graphic illustration of a ground causing a short circuit, due to worn insulation. Much more satisfactory results can be obtained with a test set of this nature than with either an expensive hand ringing magneto test set, or with a set consisting of a bell or buzzer and a few dry cells. The former is unnecessarily expensive for the purpose while the latter has not sufficient potential to force the current through grounds or breaks that present too great a resistance, whereas the higher voltage of the lamp test set will cause it to give an indication where the battery set would not. With the aid of such a set, every circuit shown on even the most complicated of

wiring diagrams can be tested in fifteen to twenty minutes, maybe less, depending upon how accessible the connections of the various circuits happen to be.

If preferred, owing to greater convenience, a 6-volt lamp can be used in the socket of the test set and current from the car battery can be utilized for testing. In case the car happens to have either a 12-volt or a 24-volt system, connect lamp terminals to but three of the cells. Should the lamp not light to full incandescence it

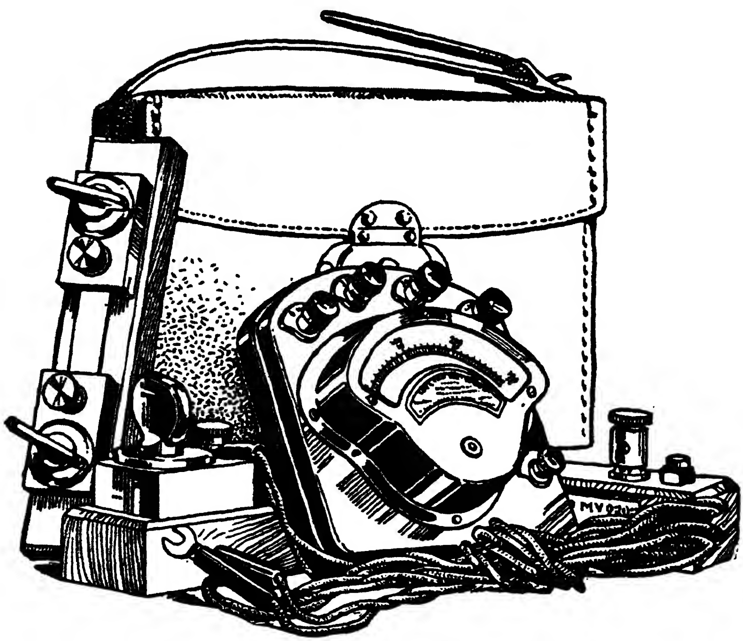


Fig. 3. Portable Combination Volt-Ammeter for Testing

will indicate that the battery is weak, and a battery that is in good condition should replace the weak one.

In case the battery does not respond to any of the ordinary methods of treatment given then, it will usually be found preferable to refer it to the nearest service station of the battery manufacturer. This is particularly the case where after refilling with distilled water to the proper level and slowly recharging, the battery does not increase in voltage and specific gravity reading with the hydrometer, as it will need overhauling before it can give good service.

Always Test the Lamp. Whether a standard 110-volt lamp or one of the 6-volt type (for which an adapter may be necessary to fit the standard socket) is used, it is a good precaution always to test the lamp itself before going over the wiring on the car. This will avoid the necessity for blaming things generally after failing to find any circuit at all—after fifteen miutes of trying everything on the car—due to the lamp having a broken filament or one of its connections having loosened up.

Special Testing Instruments. For the garage that claims to be fully equipped to give all necessary attention to the electrical system of the modern car, something more than the simple lamp testing outfit is necessary. Portable volt-ammeters such as shown in Fig. 3 are made specially for this purpose. This is a Weston combination volt-ammeter, the voltmeter being provided with a 0–30, 0–3, and 0 to $\frac{1}{10}$ scales for making voltage tests, together with three shunts having a capacity of 0–300, 0–30, and 0–3 amperes, respectively, which are used in connection with the $\frac{1}{10}$-volt scale for making current measurements. A special set of calibrated leads for use with these shunts is also provided. With the aid of such an outfit, accurate tests can be made covering the condition and performance of every part of a starting-lighting and ignition installation. For example, a starting system may be otherwise in perfect working condition, but its operation causes

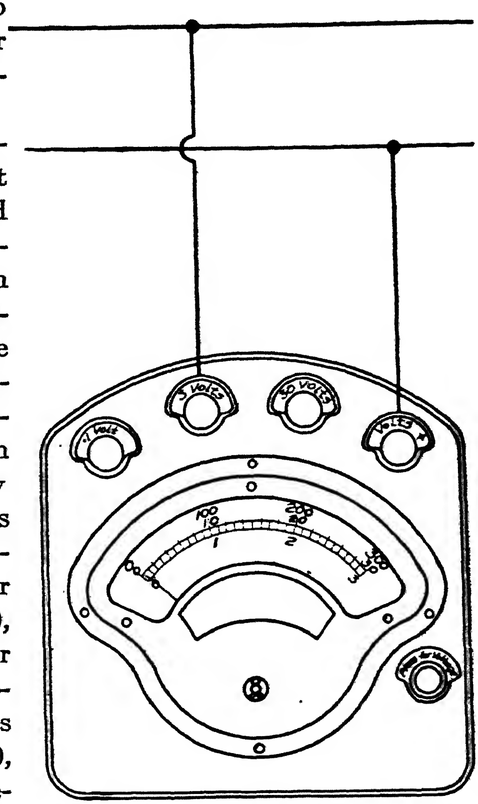


Fig. 4. Diagram Showing 3-Volt Scale Connected across a Circuit

such an excessive demand on the storage battery that the generator is not capable of keeping the latter sufficiently charged. Generator tests, which are described later, having failed to show anything wrong with the dynamo, a test of the starting motor, using the 0–300-ampere shunt of the instrument would doubtless show that an unnecessarily large amount of current was being demanded by the motor for its operation, and indicate a fault in the latter.

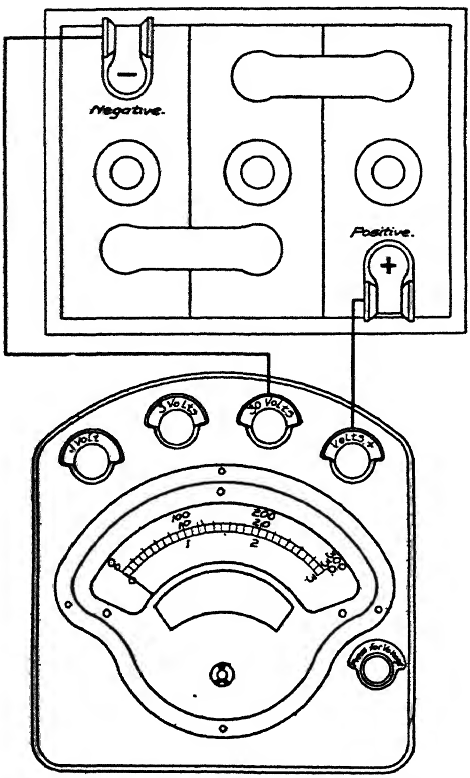


Fig. 5. Diagram Showing 30-Volt Scale Connected across Storage Battery Terminals

Voltage Tests. When the instrument is used as a voltmeter it is necessary to select the proper scale for the circuit, and if there is any doubt it is well to start with the 30-volt scale. For testing individual cells of the storage battery the 3-volt scale would naturally be used, while for testing the entire battery, the 30-volt scale would be the proper one to apply. The proper method of connecting the voltmeter to the circuit is shown by the diagrams, Figs. 4 and 5. It is necessary to connect the positive side of the meter to the positive side of the circuit and the other terminal to the negative. Where the polarity of the circuit is not known, this can be readily determined by a trial reading. If the pointer moves to the right, the connections are properly made; in case it moves to the left, it will be necessary to reverse the connections, which should be done at the circuit terminals and not at the meter, to avoid any accidental short circuits.

Ammeter Readings. When using the ammeter to determine the amount of current consumed by any of the apparatus, such as the starting motor or the lamps, it is necessary to first select the proper shunt. Should the value of the current to be measured be unknown, it is well always to start with the 300-ampere shunt

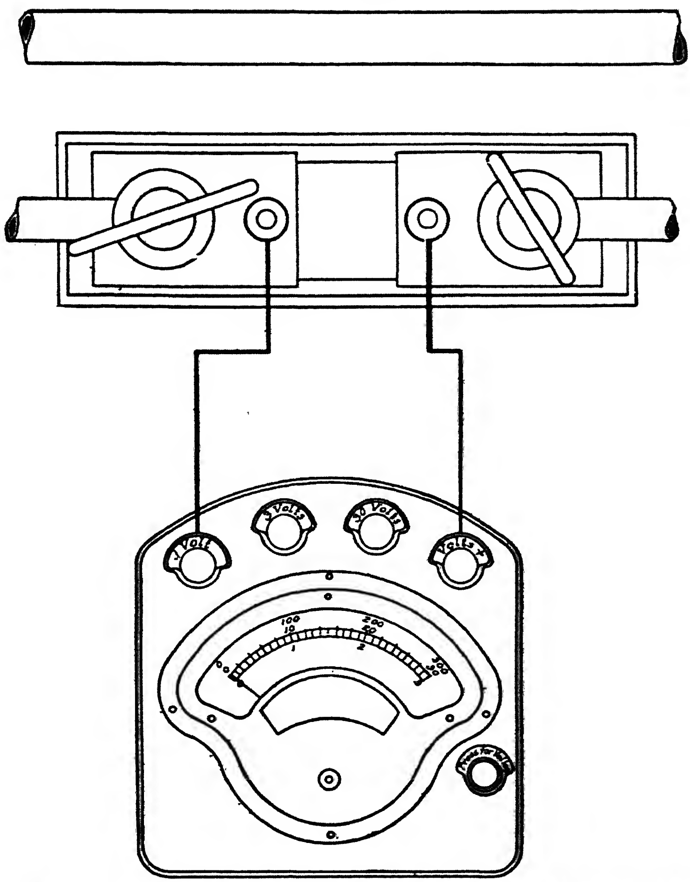


Fig. 6. Diagram Showing Method of Connecting Ammeter to 300-Ampere Shunt

and then insert the 30-ampere shunt in case the reading shows the current to be less than 30 amperes. These shunts are connected in the manner shown by Fig. 6, and as will be plain from this diagram, all shunts are connected in the circuit in a similar manner. The connections always remaining the same, it is only necessary

to substitute the different shunts as required by the circuit to be measured. If the polarity be reversed, it is only necessary to shift the connections from the ammeter to the shunt which should be done at the latter, there being no necessity to change the connections of the shunt itself to the circuit.

The 300-ampere shunt must always be used for measuring the starting current, as the latter will rarely have a value of less than 200 amperes when the switch is first closed owing to the necessity of exerting great power at first to overcome the inertia of the gasoline engine, particularly at a low temperature when the lubricating oil has become gummed. Cables of the same size as those employed on the starting-motor circuit of the car should be provided for connecting up the shunt to make the tests. The 30-ampere shunt is employed for measuring the charging current to the battery, while the 3-ampere shunt is used for the individual lighting circuits or for the primary ignition current.

Care should be taken to use instruments of the proper capacity so that no damage will be done to the delicate mechanism of the testing instrument. If an ammeter of 30 ampere capacity is used to test the amperage in a battery of 200 ampere capacity the mechanism inside the instrument will be damaged beyond repair.

Growler Armature Tester. This type of tester is the most efficient, and results are obtained quicker than by other methods. Several makes may be had. In selecting one, be sure that it has sufficient strength to do the work, as some of them are too small or have insufficient saturation to give results.

The principle of the *growler* is the same as that of the transformer, and it operates on alternating current, generally 110 volts. Fig. 7 shows a good design. Two coils form the primary of the transformer; the frame and pole pieces form the magnetic circuit, which is open.

When an armature is placed between the pole pieces, the armature core completes this circuit. The armature conductors form the secondary winding, and if there are no short-circuits in the coils, very little current or voltage is induced in the windings, as in any transformer. Should there be a shorted coil, a heavy current is induced owing to the closed circuit of the short-circuited coil. This sets up a heavy vibration at the

slot carrying the shorted coil, which can be felt, or heard, by placing a piece of thin steel or a hack-saw blade over the slot.

Operation. In testing, the armature is slowly revolved in the growler, and each slot is felt with the saw blade, as it comes to

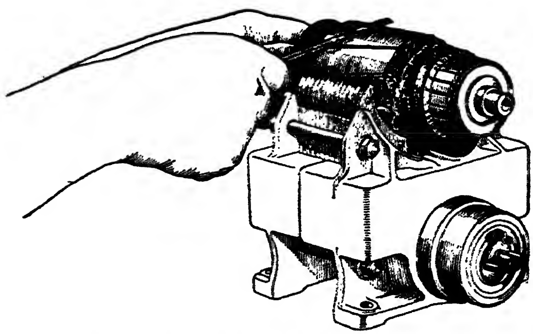


Fig. 7. Testing an Armature on a Growler
Courtesy of Studebaker Corporation

the top. If the armature is left on for a few minutes, the short-circuited coil will become hot and will eventually burn out. Commutator shorts due to small particles of copper dragged over the

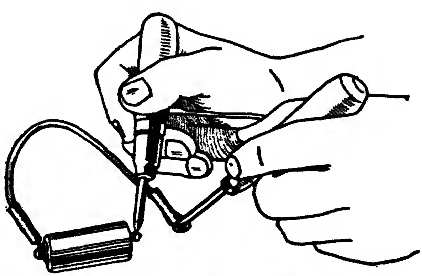


Fig. 8. Testing the Condenser

insulation when turning, commonly called "bugs," will be burned off by this heavy induced current. A poorly designed growler will not do this. In testing for an open coil, short-circuit each commutator segment in turn as the armature is revolved; each segment should give a spark owing to the induced current. In case of an open coil, no spark will result. In testing for grounds such as between the commutator and the armature shaft, a grounded winding will cause a spark.

Testing the Condenser. The test points and lamp may be used to test the condenser, as shown in Fig. 8. The condenser is removed and laid on the bench top or in other insulated position. The 110-volt alternating current is used. If the lamp lights, the condenser is in bad condition and should be discarded in favor of a new one.

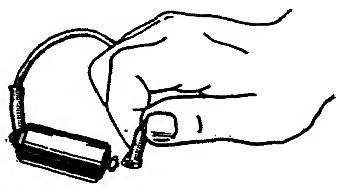


Fig. 9. Condenser Capacity Test

If the lamp does not light, make the test shown in Fig. 9, which is termed a capacity test. After the test shown in Fig. 8 has been completed with the condenser apparently in good condition, grasp the pig tail and bring it to the contact screw as shown. As it is

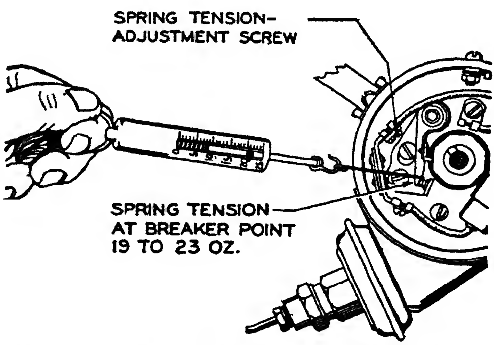


Fig. 10. Checking Spring Tension on Contact Points
Courtesy of Buick Motor Company

brought into close position with the contact screw, a spark will discharge from the pig tail to the screw. The ability of the condenser to hold a discharge over a period of time, such as one hour or more, indicates that it is in good condition. A more exacting capacity test with more accurate equipment is described in the next section of this volume.

Spring Pressure Testing Scale. High-speed automobile engines require that all parts be adjusted to very accurate specifications and

limits. It is for this reason that the use of the accurately graduated spring tension scale, shown in Fig. 10, is used so commonly in the garages. This spring scale is graduated to read in ounces. It is used not alone for measuring the pressure on the contact points within the distributor, but it is also used for measuring the spring pressure on the generator brushes and the starting motor brushes. Specification sheets of the various manufacturers of electrical equipment ordinarily indicate the pressure in ounces that it is desirable to have on equipment which is being checked or reconditioned. This

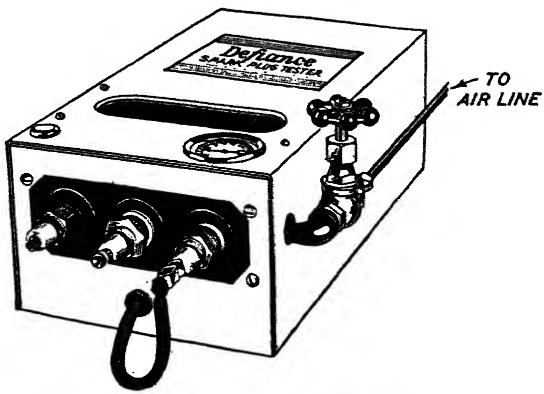


Fig. 11. Compression Type Spark Plug Tester
Courtesy of Defiance Spark Plugs, Inc.

naturally varies for the different units. The specifications of the manufacturers should always be followed. For instance, if the pressure on the contact points in the ignition distributor is not correct, this may cause missing of the ignition, because of the inability of the contact arm rub block to follow the contour of the cam.

Compression Type Spark Plug Tester. To test the spark plugs under conditions approximating those under which they are operating, the compression test is sometimes used. A device designed to handle this type of test is illustrated in Fig. 11. The device is equipped with the electrical connections necessary for plugging into the regular current supply from the lighting circuit. A transformer and coil are incorporated. In use, the spark plug to be tested is screwed into the compression chamber which is fitted with screw threads to take the popular types of plugs. After the plug is in

position the needle valve is opened and air is admitted to the chamber until the gauge on the device registers the correct pressure desired. The button on the upper left-hand of the device is then pressed and if the spark plug is in good condition the spark may be seen as it is reflected in the glass on the top of the device as it appears jumping from the electrode to the shell. Not only is the device a good one to use for proving the actual condition of spark plugs, but it helps to convince the customer that his spark plugs are in good, or, as the case may be, in bad condition.

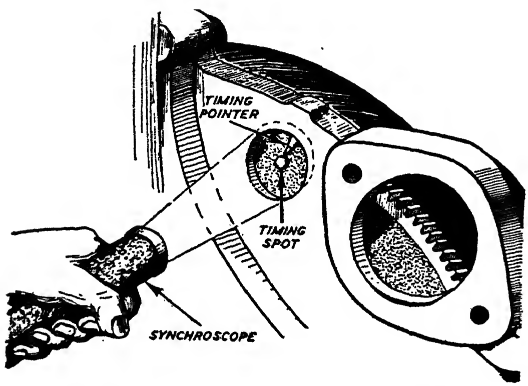


Fig. 12. Timing Ignition with the Aid of the Synchroscope

Timing Ignition with the Synchroscope. The synchroscope is a neon light device designed to be operated by means of the ignition current. The method of using this device is illustrated in Fig. 12. The contact breaker points are cleaned and adjusted to the specified gap, after which the lead of the synchroscope is connected to the spark plug wire cable of cylinder No. 1. Car manufacturers making use of this type of ignition timing set a steel ball into the flywheel metal. This ball is in a position designed to line up with the pointer on the flywheel housing. Spark timing is correct when the ball lines exactly with the pointer. By using the synchroscope it is possible for the mechanic to secure this alignment of the ball with the pointer while the engine is running. The flash of the neon light by means of the spark from cylinder No. 1 serves to make visible to the operator the exact position of the ball at the time the spark flashes. The

appearance of the ball is as though the flywheel were standing still. Thus, it can be determined whether or not the ball is in exact alignment with the pointer. If it is not in alignment, the distributor clamp bolt should be loosened, with engine running at idle speed, and the distributor revolved the required amount to bring the pointer and steel ball on the flywheel in line. After the alignment is perfect the distributor should be locked in position.

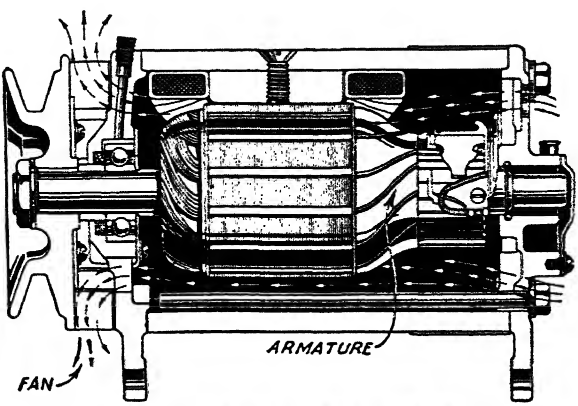


Fig. 13. Pontiac Air-Cooled Generator
Courtesy of Pontiac Motor Company, Pontiac, Michigan

Generator Output and Regulation. *Test Equipment.* The use of radios, heaters, and other electrical accessories has put an additional load on the battery. This means that without adequate charging, the battery is likely to become too rapidly discharged. If the charging rate of the generator is increased to take care of this added load, it is possible that the life of the generator would be shortened because of overheating. The increase in generator voltage would tend to shorten the life of light bulbs, and perhaps cause them to burn out. Distributor points would tend to burn and not last as long.

The Delco-Remy engineers have designed a fan-cooled and ventilated generator, Fig. 13, with automatic voltage regulator. The vibrating voltage regulator cuts in a resistance in series with the field when the battery voltage reaches a predetermined value. The Pontiac Motor Co. uses a volt-ampere test for checking and adjusting the voltage regulator fitted in the generator and battery circuits.

on their cars. According to the Pontiac Co., the testing and adjustments should be made as follows.

Checking the Generator with a Volt-Ampere Tester. Before checking the generator, the generator charging circuit and ground circuit should be checked. Connect the volt-ampere tester, as shown in Fig. 14. Disconnect the lead from the battery (Batt.) or am-

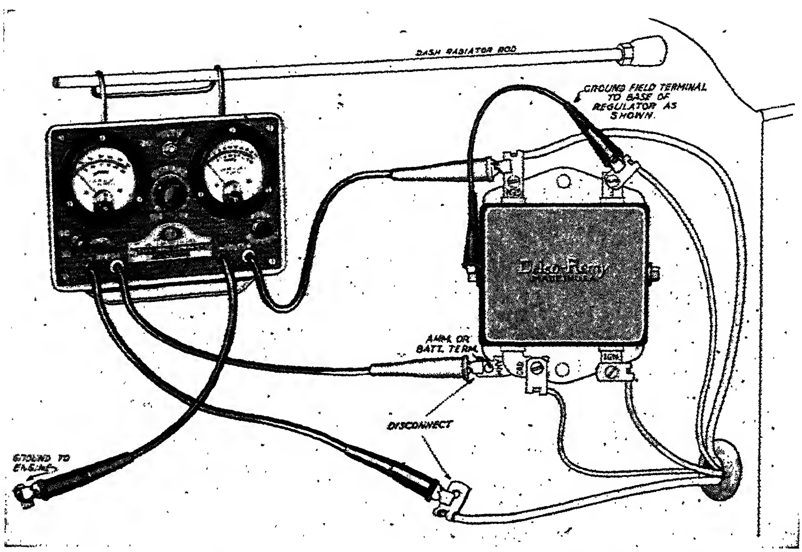


Fig. 14. Connection for Testing Generator Output with Volt-Ampere Tester
Courtesy of Pontiac Motor Company, Pontiac, Michigan

meter (Amm.) terminal of the regulator, connecting the positive ammeter lead to the battery or ammeter terminal of the regulator and the negative ammeter lead to the disconnected battery or ammeter lead. Connect the positive (Red) voltmeter lead to the generator (Gen.) terminal of the regulator, and ground the negative voltmeter lead (Black) to the vacuumatic spark control tube at the distributor. Set engine speed for maximum generator output (approximately 30 to 35 miles per hour). Ground the field (F) terminal of the regulator with a jumper lead, as shown in Fig. 14, to eliminate the regulator resistance.

If the voltmeter reads less than 8.5 volts, adjust the resistance in the volt-ampere tester to obtain this reading. With this voltage

the ammeter should read 20 amperes or more. If the voltmeter reads 8.5 volts or more, without the use of the resistance in the volt-ampere tester, and the ammeter reads 20 amperes or more, the generator is operating satisfactorily. The hot output will be approximately 2 amperes less.

Specifications for Relay Cut-Out. Contact points close at 6.5 to 7.25 volts. The contact points open at 3 amperes reverse current at 6.3 volts.

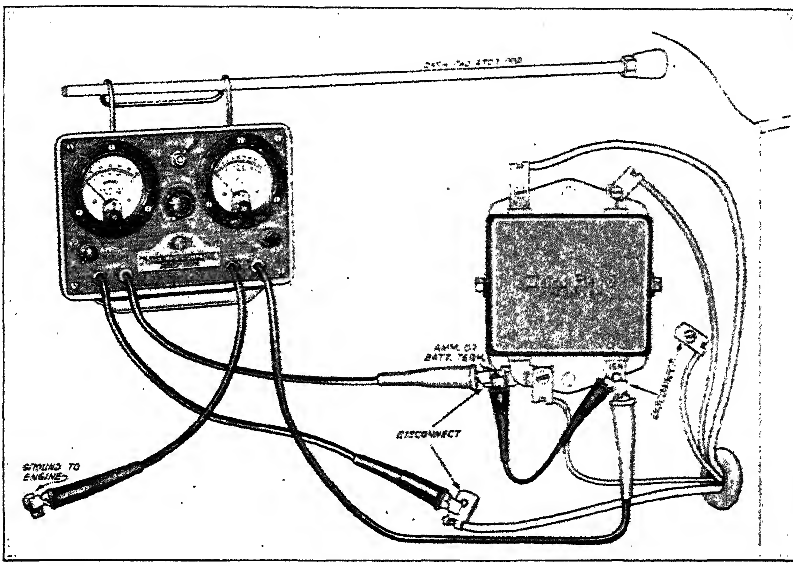


Fig. 15. Adjusting the Voltage Regulator
Courtesy of Pontiac Motor Company, Pontiac, Michigan

The contact point separation is .018 inch to .025 inch. The air gap is .018 inch to .022 inch between the armature and the core, with the contact points closed.

Checking and Adjusting the Voltage Regulator with a Volt-Ampere Tester J-795. Connect the volt-ampere tester as shown in Fig. 15. Be sure to disconnect the lead from the ignition (Ign.) terminal of the regulator and, using the jumper lead, connect the ignition (Ign.) terminal to the Battery (Batt.) or ammeter (Amm.) terminal.

Connect the positive voltmeter lead to the ignition (Ign.) ter-

minal of the regulator, and the negative voltmeter lead to a good ground, preferably the vacuumatic spark control tube at the distributor. Connect the ammeter as in Fig. 15. Loosen the voltage regulator cover, but do not remove it. Set the engine for maximum generator output (30 to 35 miles per hour). Adjust the resistance in the volt-ampere tester until the charging rate is from 8 to 10 amperes. (In some cases when the battery is fully charged, it may be necessary to turn on the lights to raise the generator output to this figure.)

If the generator is hot the voltage should be 7.45 to 7.55 volts, and 7.55 to 7.85 volts when the generator is at room temperature.

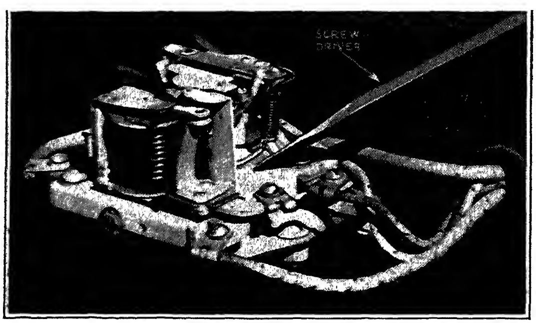


Fig. 16. Pontiac Voltage Regulator
Courtesy of Pontiac Motor Company, Pontiac, Michigan

The voltage is controlled by the tension on the coil armature spring. If the voltage is too high or too low, it may be changed by removing the regulator cover and bending the lower spring hanger down to increase, and up to decrease, the voltage. See Fig. 16. After any adjustment, replace the regulator cover, readjust the volt-ampere tester resistance to obtain generator output from 8 to 10 amperes, slow the engine down to idling speed, then increase the speed to approximately 30 miles per hour and read the voltage.

Note. Only a slight bend of the lower spring hanger, up or down, is necessary to change the voltage reading. In case the voltage does not respond to a slight movement of the spring anchor, make the following adjustments:

Adjusting the Air Gap. Press down the hinged armature until the fiber bumper on the end of the top regulator contact spring just barely touches the contact spring stop. In this position the air gap

between the hinged armature and the outer end of the magnet core should be .070 inch.

Adjusting the Gap between the Fiber Bumper and the Stop. The hinged armature should be released and the gap between the fiber bumper and its stop measured to see if it is within the limits of from .008 inch to .013 inch. If not, adjust it by bending the

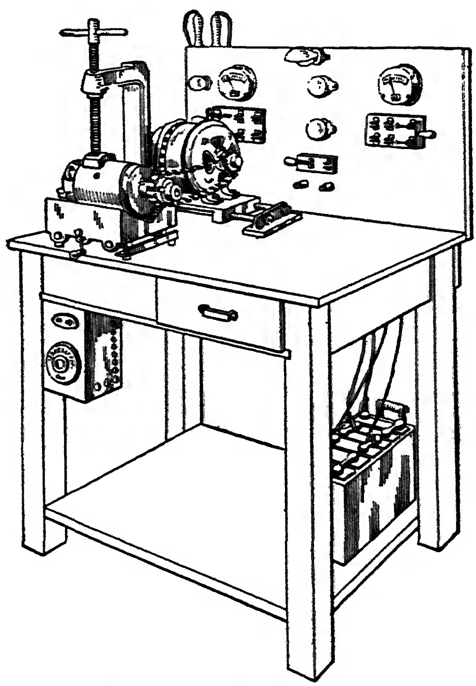


Fig. 17. Electrical Test Bench
Courtesy of Motor Age

UPPER ARMATURE stop. The hinged armature should now be pressed down until it touches the *LOWER ARMATURE* stop. With the armature in this position the regulator point separation should be from .018 inch to .025 inch. If adjustments are found necessary they should be made by bending the lower armature stop.

Grounding the Regulator. Remove the regulator assembly and make sure the case and bracket are properly grounded to the dash.

Cleaning the Contact Points. Excessive sparking and erratic operation of the voltage regulator unit contact points, due to low tension on the upper contact spring or to misalignment of the con-

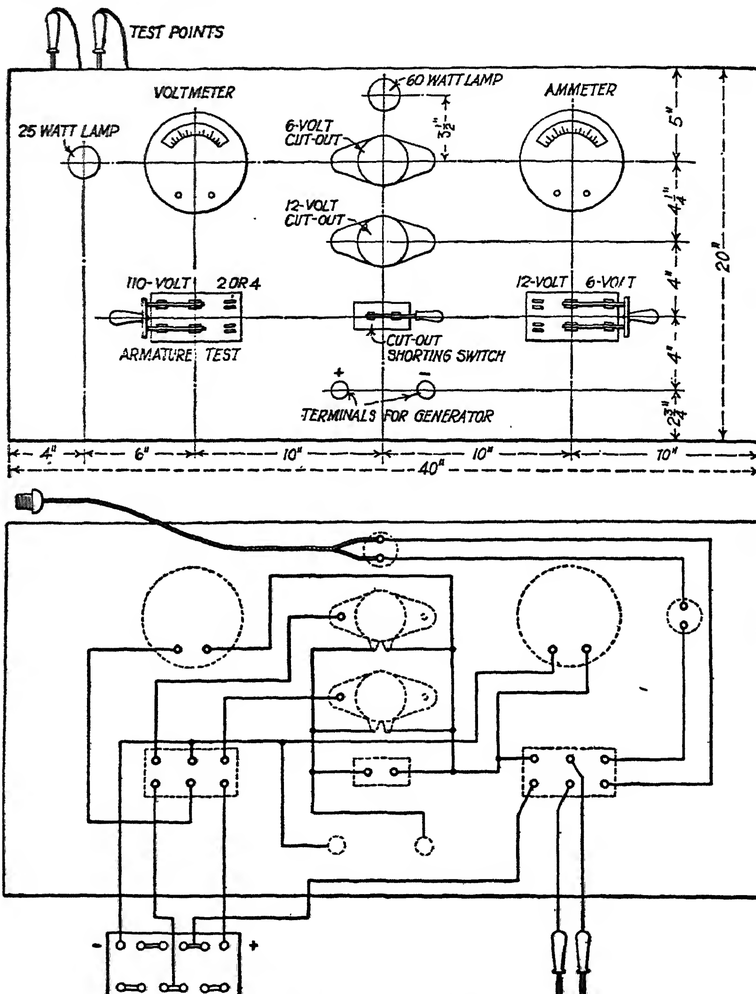


Fig. 18. Front and Back View of Electrical Test Bench
Courtesy of Motor Age

tact, may in time oxidize the contact points to such an extent as to cause high resistance and prevent the generator from charging. The contacts may be easily cleaned by the use of a thin, fine-cut con-

tact file, being careful not to take too much metal off the upper contact, since the active metal is a wafer only a few thousandths of an inch thick. Never use sandpaper or emery cloth to clean contacts. Radio by-pass condensers connected to field terminal of generator will cause the points to oxidize.

Generator Test Bench. Fig. 17 shows a test bench that can be made for testing generators. The bench consists of a generator stand; a direct-current or an alternating-current motor, according to the power available; a 6- and 12-volt cut-out; switches of the 10-ampere double and single pole, single- and double-throw type;

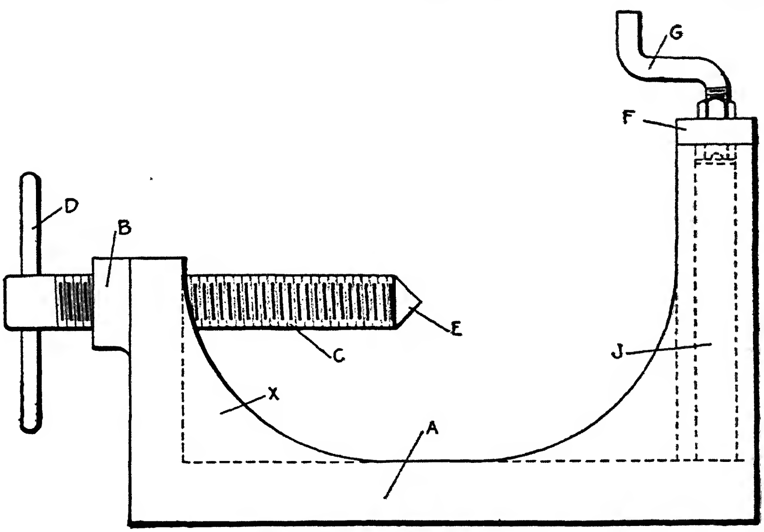


Fig. 19. Bearing Puller Side View

15-volt meter; and ammeter to read 30-0-30 of the direct-current type. A pair of test points to work from a 110-volt line, a red lamp in series to test the armature and field windings, with binding posts and lamp and socket to light the bench, complete the equipment. Fig. 18 shows the front of the board with the instruments in place, and the back of the board with the proper connections for the different units on the test stand. If there is a cut-out on the machine being tested, the cut-outs on the board are not required and the cut-out switch may be closed. Switch can be opened for use of cut-outs by using right-hand switch for either 6- or 12-volt generators.

The stand can be used to test the generator as a motor by

simply opening the cut-out shorting switch so that the generator can take current from a battery that is used in conjunction with the test stand. The output of the generator can be tested, also, by driving it with the motor and throwing the desired cut-out into

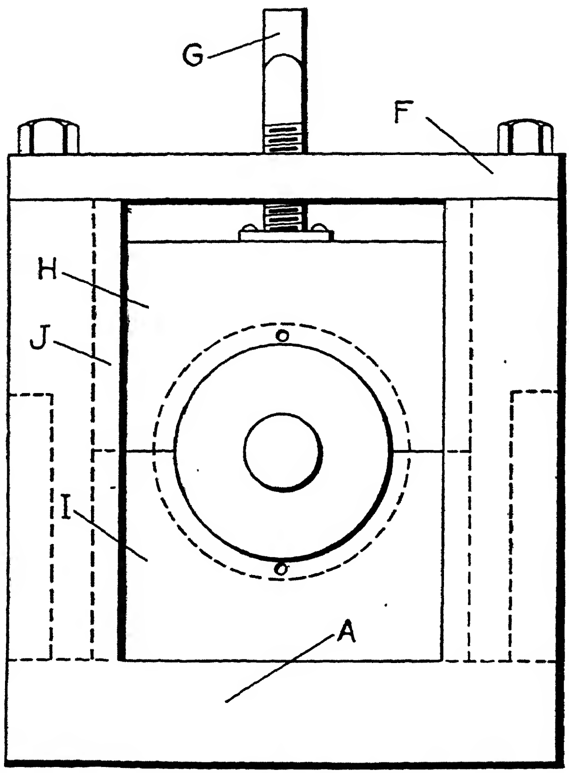


Fig. 20. Bearing Puller End View

the circuit, and the ammeter will show the current output while the voltmeter will show the voltage of the battery.

The test points can be used on the 110-volt line by placing the left-hand switch in the left position, or used for low voltage test by placing in the right-hand position. These test points are handy for carrying out armature and field winding tests as stated. When the switch is at the right-hand position the points are connected to the battery.

Bearing Puller. There are several bearing pullers on the market, but they are not adaptable to every kind of job and are weak when it comes to a real hard pull. A practical puller is shown in Fig. 19. The base *A* is of cast iron, having a front vertical standard *J* and a boss *B* cast to receive the screw *C*. This screw is ¾ inch with a standard thread. A good snug fit should be made,

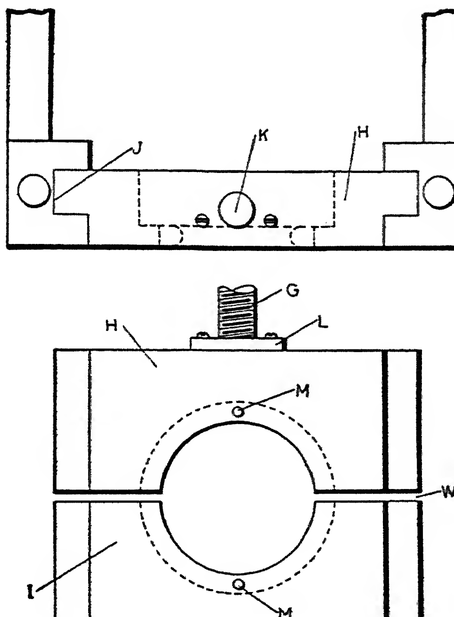


Fig. 21. Assembly of Bearing Puller Clamps

as wear will eventually cause it to become slightly loose; the cross-bar *D* is used in turning the screw. The plate *F* on the front standard is held on by two ⅜-inch cap screws and carries the clamp screw *G*, which holds the jaws together. The ribs are placed on each end to strengthen the base, and four holes are drilled in the base to bolt it to the bench. Fig. 20 shows the sliding jaws *H* and *I* which fit into a slot in the end standard *J;* the slot is cut from top to bottom. The top plate *F* carries the clamp screw *G* which is ⅜ inch with an S.A.E. thread; the lower end has a groove turned in it. This plate fits on the screw *G* and is held on the

sliding block *H* by two 8-32 screws. The block is counter bored to allow the end of the screw to turn free; this device is to raise the block in changing jaws.

The sliding blocks are shown in Fig. 21; these blocks are cut away, as shown, to receive the jaws, which are held by the two small pins *M*. In recessing the blocks, place them in the lathe

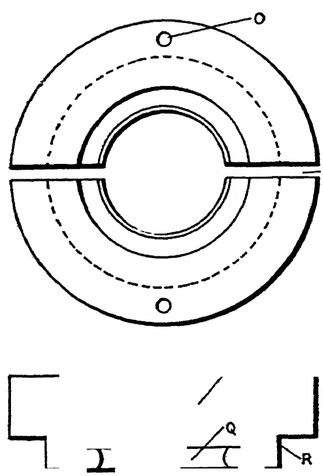


Fig. 22. Bearing Puller Clamps

with a piece of 1/8-inch metal between them at *W;* this will make it possible to tighten the jaws in place. The jaws used to grip the bearing are shown in Fig. 22 and should be made of steel, either tool or cold rolled, and case hardened. They are made of round stock of the proper outside size, cut off in lengths, faced off, bored out at *P*, and turned round in the chuck with the shoulder *R*. The jaw face at *Q* is bored and rounded to fit the face of the bearing. The jaws are made for several sizes of bearings, a different set of jaws being made for each.

Ignition Timing Indicator. The type of ignition timing indicator utilized for timing of Chrysler motors is illustrated in Fig. 23. The device is assembled to the engine at the spark plug hole. An indicating arm is projected into the combustion chamber to rest on top of the piston which is brought onto upper dead center compression stroke. In any case, it is necessary to consult the data sheet supplied by the maker of this type of equipment or by the car

manufacturer recommending its use. For instance, if the timing should occur according to the information available at .030 before top dead center, locate the top dead center on the compression stroke of the piston. Next, move the dial of the indicator to zero and then to the left thirty times. Reverse the engine rotation until the hand passes the zero point about .025 inches. Then rotate the

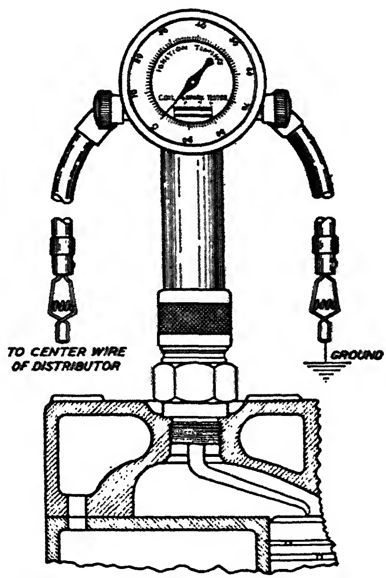


Fig. 23. Checking Ignition Timing
Courtesy of Chrysler Corporation

crankshaft in a forward direction bringing the piston up slowly, and stop at zero. This will take up all backlash in the distributor. Next turn the distributor until the spark fires in the spark gap, at which point the distributor should be locked in position.

The same type equipment may be utilized for checking the coil and condenser, in which case the set-up is as shown in Fig. 24. Connect the timing indicator in series with the coil and distributor. With the engine operating, check the spark at different engine speeds. If the spark cuts out between zero and five, it indicates a defective coil. Move the right-hand adjustable screw to 7 millimeters and if the spark cuts out between zero and seven, this indicates a defective

condenser. Only the right-hand terminal is adjustable, the left-hand one being fixed in position.

Voltmeters and Ammeters. In some instances, it is desirable to

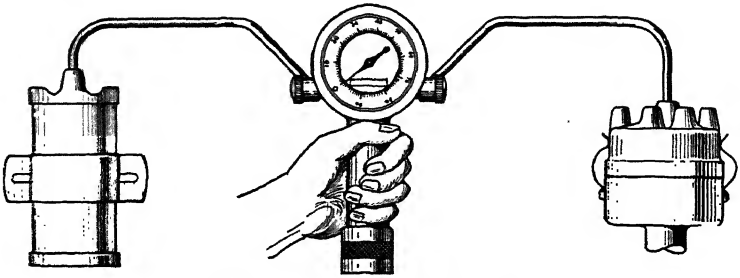


Fig. 24. Testing Coil and Condenser
Courtesy of Chrysler Corporation

have the voltmeter and ammeter separate; that is, two individual instruments instead of a combined instrument as shown in Fig. 3.

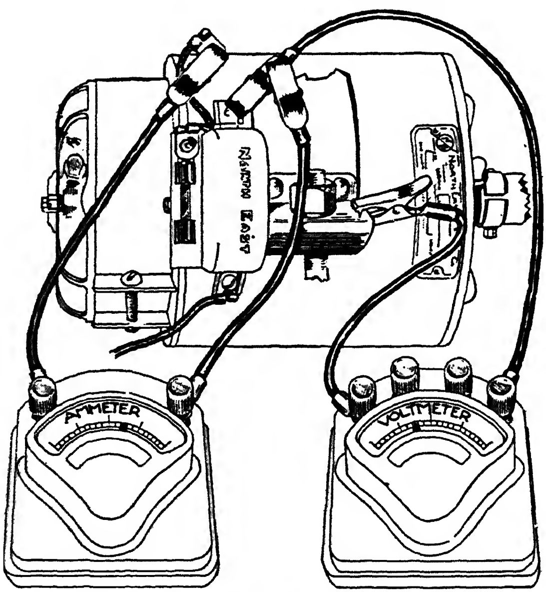


Fig. 25. Checking Generator with Instruments Connected at Cut-Out Terminals
Courtesy of Delco-Remy

In any case, it is essential that the instruments be of known quality. Fig. 25 illustrates such instruments in use for checking at the cut-out

terminals of a North East generator. In utilizing this type equipment for checking the generator, it must be remembered that the output readings at the dash will be approximately 2 amperes lower than the reading taken at the generator terminal. When checking the voltage reading as well as the ammeter reading, reference should be made to the manufacturer's specifications for voltage and output for the type equipment being checked. The amperage is usually checked with the generator connected to a fully charged battery. In no case should the amperage be allowed to exceed the specified setting of the generator. In cases of high voltage, the output should be reduced

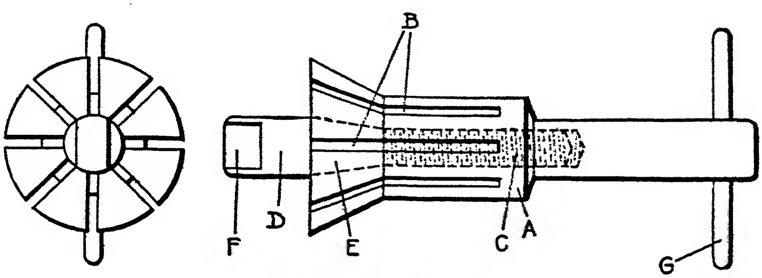
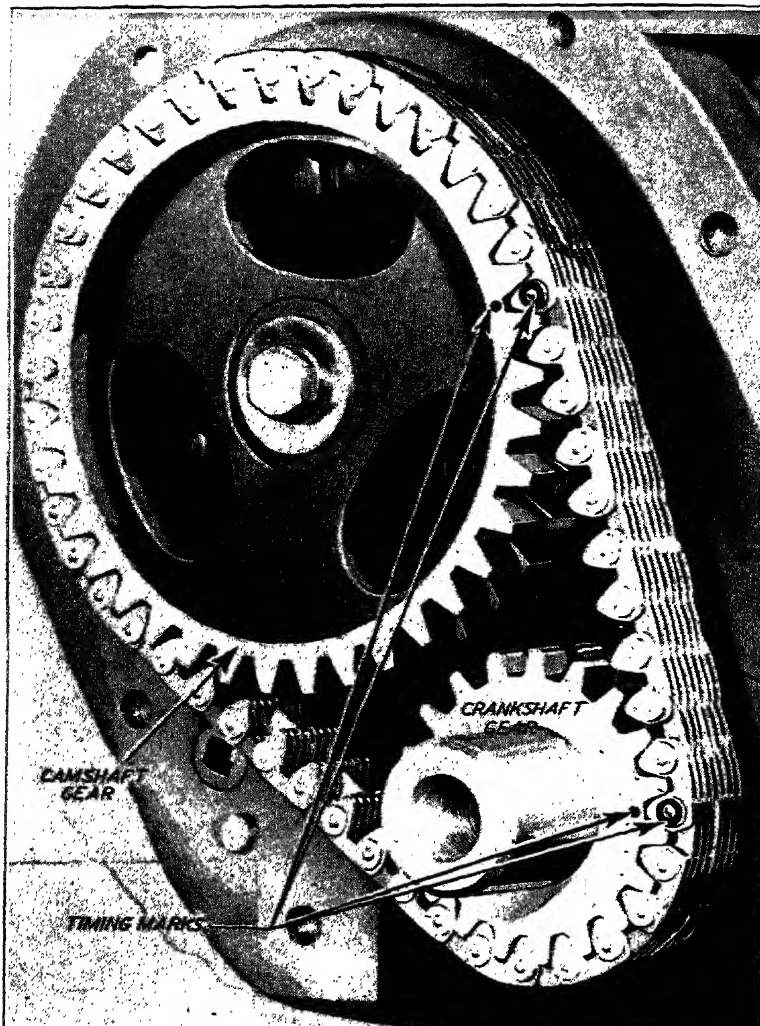


Fig. 26. Cone Puller

so as to more nearly conform with the driving conditions or the electrical requirements of the automobile on which the generator is in use.

Bearing Cup Puller. As it is very hard to get a bearing cup out of an end plate, such a puller as shown in Fig. 26 is quick and efficient. The body *A* is made of cold-rolled steel, the lower end being shaped to a sharp angle and slotted so that it will expand. These slots *B* may be milled or cut with a hack saw. A $\frac{7}{16}$-inch hole *C* is drilled and threaded with an S.A.E. thread, and a taper bolt *D* is screwed into the hole. This screw has a taper *E* which expands the body of the puller, a flattened portion *F* being made for a wrench. A **T** handle is placed in the shank at *G*, and the whole tool is case hardened. In using this puller, the screw is backed out and the sharp angle points placed back of the cup. The screw is then turned up tight and the whole assembly struck sharply on the bench, striking the screw, when the cup will be forced out without damaging the cup or the end plate.



THE 1937 BUICK ENGINE TIMING MARKS

MOTOR ANALYSIS

CAR EQUIPMENT TUNE-UP

The purpose of the equipment which is designed to make a complete analysis of the operating condition of an engine, and the accessories with which engines are equipped, is to eliminate the guesswork from trouble finding. The development of test equipment such as is necessary for this work, is one which covers a period of many years. The student-mechanic who has mastered the contents of the earlier sections of these volumes, is in a position to profit by making a most careful study of the operation of the motor analysis and tune-up equipment. Specialized units of testing equipment which are used on the test panel of the motor analyzer and tune-up equipment, illustrated in Fig. 1, have been developed with specific ends in view. Indications of the instruments in use for the tests being made are of such nature as to show (not only to the operator using the equipment but to the customer who owns the car) definite reactions which fix in the mind of the customer the fact that the motor is or is not right.

Using Tune-Up Equipment to Sell Work. More and more car owners are in the habit of taking their automobiles to reliable service stations for periodic check-up on tune-up and analyzing equipment. At the time this work is done, the operator in charge of the equipment makes out a form sheet on which the results of all of the tests are shown, indicating to the customer the need or desirability of having certain repair operations, such as are treated in the early part of these volumes, performed on his automobile. The old saying that "seeing is believing" has much to do with the knowledge of the operating condition of the automobile engine and its accessories.

It is quite essential that the operator handling this type of equipment be well trained, otherwise he may confuse results and give out statements with reference to conditions of the automotive equipment being tested which cannot be supported should the customer take his car to another shop to have the indicated repairs made. When making tests for trouble finding in any of the several

Note. The illustrations and information contained in this section are available through the courtesy of Joseph Weidenhoff, Inc., Chicago.—Ed.

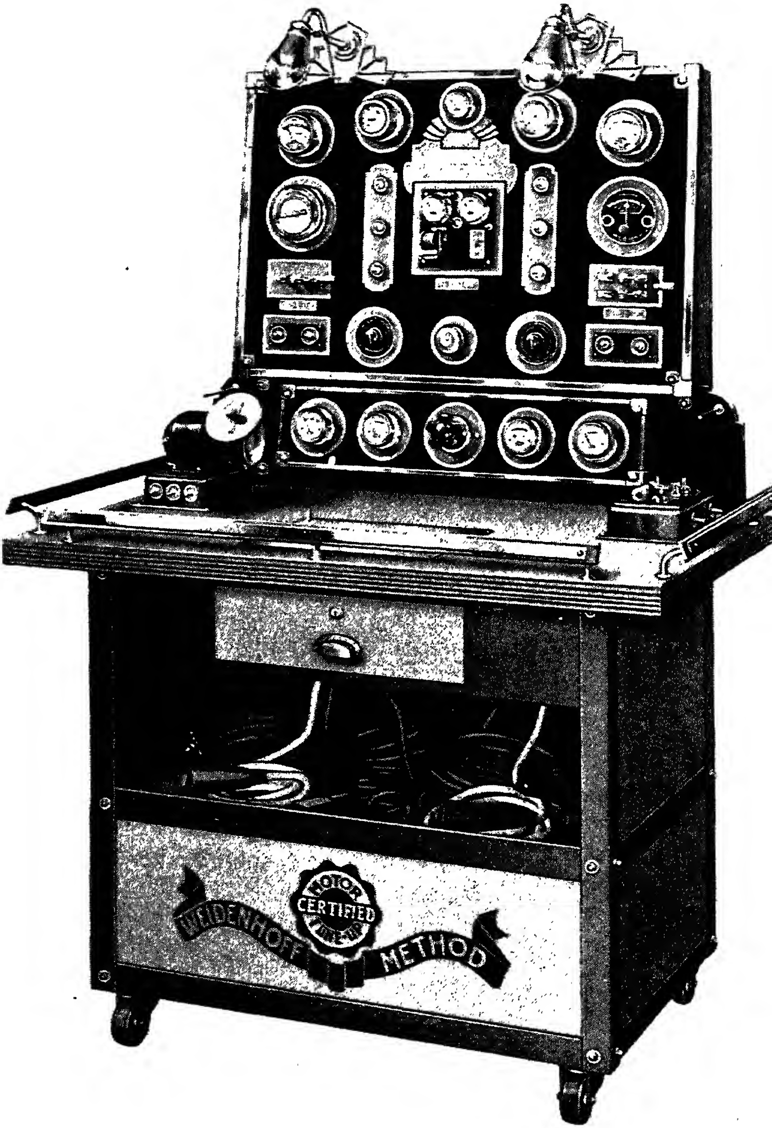


Fig. 1. Motor Analyzer

systems of the automobile, an exact method of procedure should be followed so that no part is missed. As mentioned previously, usually these operations and their sequences are indicated on form sheets which are filled out by the one doing the testing. Ordinarily the tests are made somewhat after the order of the grouping and listing in the following pages. In some cases it is imperative to have certain tests made before other tests are made. In certain other cases this is not essential. An example of this is the case of the battery and the electrical equipment. If the battery is not in good condition, it naturally follows that electrical tests cannot be made with complete success.

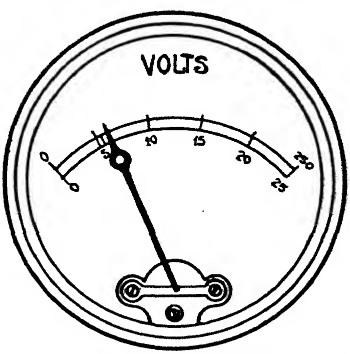


Fig. 2. The Voltmeter

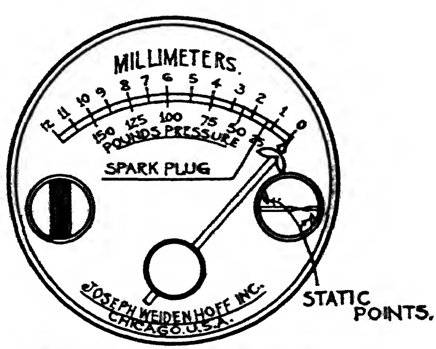


Fig. 3. The Spark-Plug Testing Gauge

Tune-Up Test Equipment. The equipment used for motor analyzation and tune-up work is usually built up in an attractive panel and work bench style such as is illustrated in Fig. 1. If the equipment is mounted on a portable work bench the bench with all leads and so forth may be moved close to the car to be analyzed. In the main the equipment consists of voltmeters, ammeters, vacuum gauges, switches, electrical motor, electrical leads and other instruments designed to make and record the result of the tests being made.

Caring for the Testing Equipment. Inasmuch as the testing equipment bases its real value upon accurate instruments, it follows that these instruments must be checked daily and kept in first class condition. For this reason it is suggested that the operator of such equipment familiarize himself first with the care of the equipment and, especially, the test instruments on the test bench.

Testing Analyzer Battery. Check the battery on the analyzer to see that it is always 6 volts or more. This test should be made with the coil connected. This puts a 4-ampere load on the battery and under this condition it should read not less than 6 volts. If in good condition and properly charged, the reading on the voltmeter, Fig. 2, should be 6.2 volts.

Check Static Points. The clearance between the static points and the gap electrodes, Fig. 3, should be .005-inch. Check these daily to see that dust does not accumulate between the points and the gap electrodes. The spark points should just touch at the zero setting of the gap.

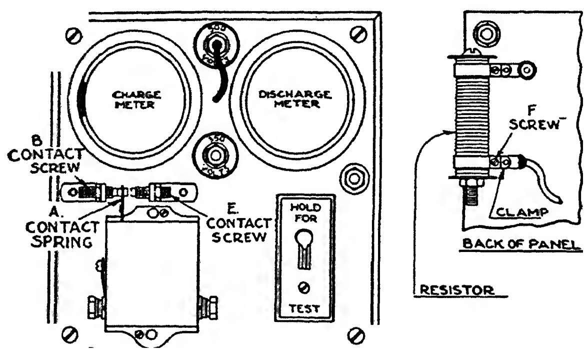


Fig. 4. The Condenser Tester

Adjusting the Condenser Tester. The contact spring *A*, Fig. 4, should rest with a slight tension against the contact screw *B*. Adjust the contact screw *E* until the discharge meter reads the same as the charge meter. If unable to get the same reading, adjust the resistor, which is located in back of the discharge meter, by loosening the screw *F* and adjusting with the clamp. All adjustments should be made with the 500-volt tap.

Inspection and Adjustment of the Breaker Motor. The small motor on the left-hand side of the test equipment, shown in Fig. 1, is illustrated in diagrammatical form in Fig. 5. First set the pointer to 20 degrees, loosen the screws *A* and *B* and adjust the plate *C* in the direction of the arrows so that the points remain closed during 20 degree travel of the cam, as marked on the disc *D*, Fig. 5. If the disc

D does not line up with *F*, loosen the screw *E* and re-adjust. Movement in the direction of the arrow *X* is as follows: up decreases the cam angle and down increases it.

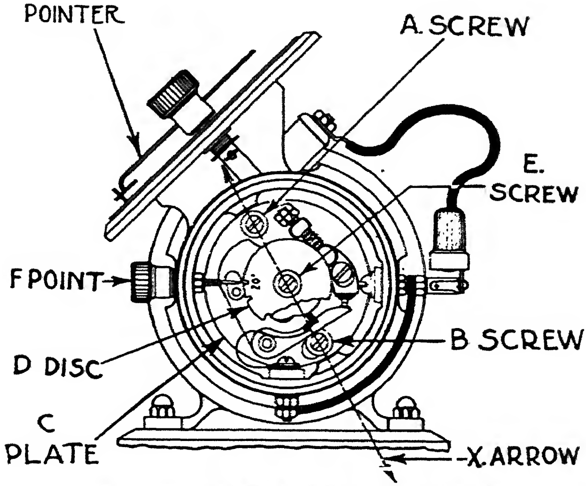


Fig. 5. The Breaker Motor Adjustment Diagram

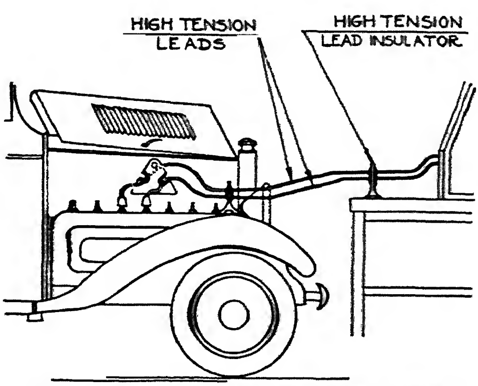


Fig. 6. High-Tension Lead Connections to Engine

Using High-Tension Test Leads. When using the high-tension testing equipment never permit the high-tension leads to lie side by side but always separate them with high-tension insulators, so as to have the high-tension leads maintained at least $2\frac{1}{2}$ inches apart. This is illustrated in Fig. 6.

Suggestions for Using Analyzer. Do not start testing the car until the floor boards have been removed and the battery and battery cables have been thoroughly tested and inspected, to see that they are in good mechanical and electrical condition.

Do not permit long high-tension leads to lie side by side when testing ignition equipment. Keep them separated at least $2\frac{1}{2}$ inches.

Do not try to test coils with a battery that reads less than 6 volts. Always use a fully charged battery.

Keep all the test leads and electrical cables of the analyzer in good condition. Do not allow them to become oil soaked and dirty. They should be wiped free of oil or dirt and hung on the test bench.

Do not start testing cars until fender covers are in place. This is a small item, the observance of which creates respect for the shop.

Do not permit the analyzer tools to be used except with the analyzer. They should always be kept clean and in their place, ready for use by the one in charge of the analyzer equipment.

When installing new contact points in the distributor, have it removed to the test bench fixture for that particular work. This will save time and makes for a better job. A running test should be made on the distributor before replacing it.

Before making any connections on the engine or its accessories, be sure that all of the switches on the analyzer are open.

Keep the analyzer in good condition with the bright parts polished and protected with a film of oil. Renew the paint on the painted portions of the equipment occasionally.

TESTS WHICH MAY BE MADE WITH THE MOTOR TUNE-UP EQUIPMENT

BATTERY TESTS

Hydrometer Test. This operation is vitally important and must never be omitted. Test for specific gravity and water level. Specific gravity should not read less than 1250.

Inspect the terminals and battery cables for corrosion and wear. If found slightly corroded, the cable terminals should be removed, thoroughly cleaned, greased, and re-assembled to prevent them from becoming worse and giving future trouble. If found excessively corroded or worn, operator should point out the necessity for re-

placing at once. Unless replaced, owner will eventually experience hard starting, high voltage, dim lights, or poor ignition as a result of this condition. Operator should also point out that unless this condition is corrected immediately, further tests cannot be accurately made due to excessive voltage drop caused by faulty connections.

Open Voltage Test. Use cable, Fig. 7, with two pairs of wires enclosed in single rubber cover which are connected to back of panel to the three voltmeters. With pair shown at *A*, connect the lead

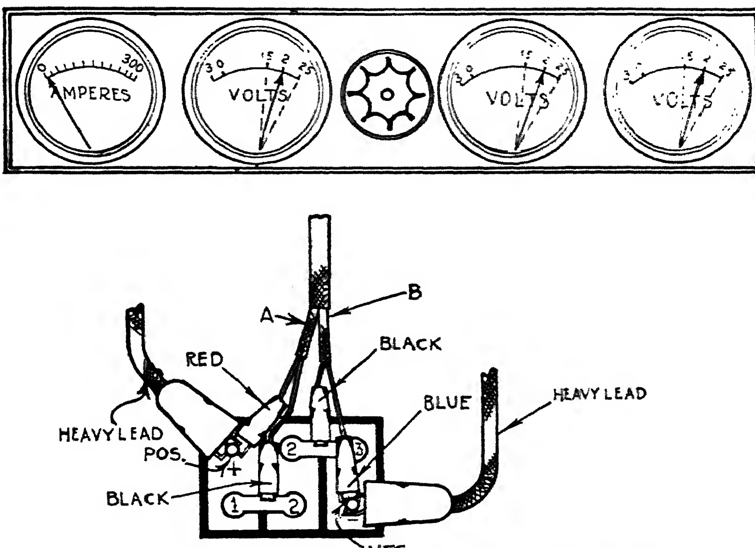


Fig. 7. (Above) Ammeter and Individual Cell Voltmeter Readings (Below) Method of Connecting Leads to Battery

with red insulator to positive terminal of battery and connect lead with black insulator to bar connecting cell *1* with cell *2*. With pair shown at *B*, connect lead with blue insulator to negative terminal of battery and connect lead with black insulator to bar connecting cell *2* with cell *3*. The reading of each voltmeter will indicate condition of each cell. All three voltmeters should read two volts or over. If reading is less than two volts for each cell, the battery is either discharged or has one or more defective cells.

Cranking Test. Leave the test leads connected as in open voltage test. (Be sure ignition switch is off.) Step on the starting-

motor switch or operate starting-motor button on dash (if startix, use startix button) and at the same time check voltmeters. With starting-motor operating, the voltage drop as indicated by each meter should be uniform, and each meter should read *not less than 1.5 volts*. If one or two cells read 1.3 volts or less, and other reads 1.5 volts or more, the battery is either discharged, or low-reading cell or cells are defective and battery should be replaced with fully charged battery before proceeding with motor analysis. Should battery cell voltage check satisfactorily on voltmeters (1.5 or more) and starting motor fail to turn engine over briskly, then make the 20 seconds capacity discharge test as described in the following instructions.

The carbon-pile control knob is located directly in the center of the sub-panel, Fig. 1. To the right you will note two voltmeters and to the left a voltmeter and ammeter. Before proceeding with the test be sure that carbon-pile control knob is turned to the left until the knob is free. Leave the voltmeter heads hooked to the battery as in open voltage test: Hook up large white (500-amp.) leads to battery, connecting insulated terminal clip to negative post. Connect other terminal clip to positive post. After determining what the ampere-hour capacity should be (refer to electrician's manual) refer to the following chart to determine ampere loads to be applied to battery for 20 seconds, and what the resultant voltage readings should be if battery is of sufficient capacity, as determined by car manufacturers.

If the electrician's manual indicates the battery should have 117 amperes starting capacity, the following chart shows loads to be applied. On 120 ampere-hour battery (nearest rating to 117) as 100-ampere load is applied for 20 seconds, the resultant voltage reading should be 1.97 volts per cell; 200-ampere load for 20 seconds, the resultant voltage reading should be 1.86 volts per cell.

Gradually turn carbon-pile control to the right until the ammeter shows you have applied the proper minimum load (load "A") as shown on the chart. Quickly note voltmeter readings on each cell. Now turn the carbon-pile control farther right to maximum load (load "B") as shown on chart, and quickly note voltmeter reading for all three cells. This load should be applied for approximately 20 seconds and meter watched for drop in voltage. Immediately turn

the carbon-pile control in neutral position (left). Load should not be applied more than 20 seconds.

MOMENTARY DISCHARGE TEST—20 SECONDS

Capacity of Battery Ampere Hours	Ampere Load		Voltage with Current Flowing
80	A	50	2.02
80	B	100	1.83
100	A	100	1.95
100	B	200	1.82
120	A	100	1.97
120	B	200	1.86
140	A	100	1.99
140	B	200	1.88
160	A	150	1.95
160	B	300	1.81
180	A	150	1.97
180	B	300	1.84
200	A	200	1.94

Note. If voltage on meters reads approximately the same as shown on chart, the battery is in good condition. Check starting switch and starting motor to determine why starting motor does not turn over satisfactorily. If on test, voltage in any cell drops under proper voltage as indicated on chart, the battery is either discharged, defective, or under capacity as specified by car manufacturer. In such cases battery should be replaced with fully charged battery of proper capacity.

Starting-Motor Test. For proper starting motor operation there must be a battery of sufficient capacity; clean and tight connections at starting motor terminal, starting motor switch, battery, and ground. Starting motor must be in good mechanical and electrical condition. Starting motor must be securely fastened to frame of car or flywheel housing. Engine must turn freely without binding.

Prepare for this test by opening the carbon pile (turn knob to left) using the cable with two pairs of wires enclosed in the single rubber cover, which are connected to the back of panel, Fig. 8, to the three voltmeters. With *A* pair connect the lead with the red insulator to the positive terminal of the battery. Connect the lead with the black insulator to the bar connecting cell 1 with cell 2. With *B* pair, connect the lead with the blue insulator to the negative terminal of the battery. Connect the lead with the black insulator to the bar

connecting cell 2 with cell 3. The reading on each voltmeter will indicate the condition of each cell. All three meters should read two volts or over. Connect the heavy white discharge leads to the positive and negative terminals of the battery. Step on the starter and note the voltage of the three cells as indicated on the three voltmeters, and make note of this voltage while the starter is cranking the engine.

Current Draw Test. Apply load to the battery by closing the carbon pile (turn knob to the right) until the voltages of the three cells drop to the same voltage as shown when the starter was cranking the engine, and note reading of the ammeter. The ammeter will

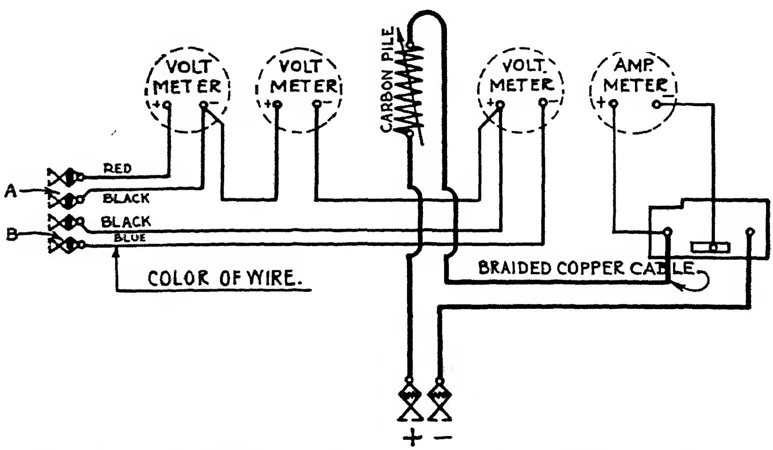


Fig. 8. Diagram of Sub-Panel Battery Tester, Showing Schematic Wiring for Weidenhoff "830" Motor Analyzer

now show the exact current that the motor draws while cranking the engine. If the current drawn is in excess of the maximum current specified, it indicates a binding engine or faulty starting motor. Use the hand to determine whether or not the engine is binding. A free engine will turn easily between compression periods. A binding engine will drag between compression periods. If hand-crank test determines that the engine is not binding, the excessive current indicates defect in starting motor and car owner should be advised that the starter needs repairing. If starting motor fails to operate properly and ammeter reading indicates subnormal current draw, the trouble lies in bad connections, faulty starting motor switch,

faulty starting motor, or weak battery. The voltage tests which follow will reveal sources of trouble.

Startix Test. "Startix" is a trade name for an automatic starter switch which operates when the ignition is switched on and is held open by current from the generator. Therefore, it is of utmost importance that the generator should be functioning properly at all times on cars equipped with Startix. An auxiliary push button is

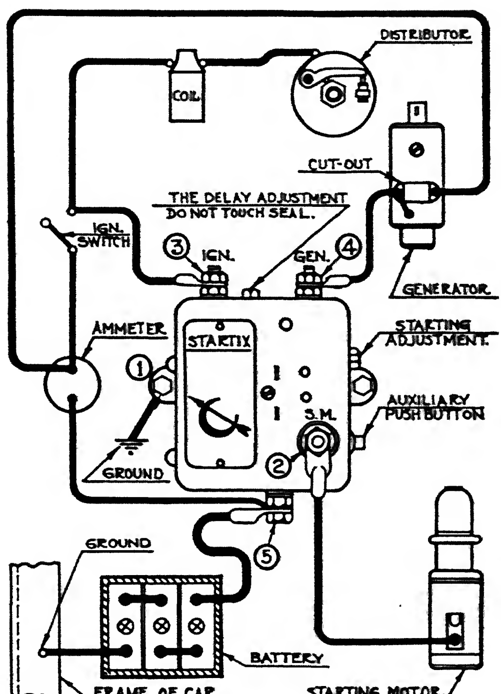


Fig. 9. Startix Test Equipment

provided, making it possible to disengage the starting switch after the engine starts, in the event the generator fails to build up sufficient voltage to open the switch. After making sure that the generator and ignition system are in good condition, that cut-out relay is working properly, and all connections are clear and tight, the following tests can be made.

Connect the voltmeter test leads to 25-volt terminals on the test panel, Fig. 9. Test the Startix case to ground by connecting one volt-

meter test lead to frame of car and the other voltmeter test lead to metal case of Startix. In this test a zero voltmeter reading should be obtained with engine either running or shut off. A voltage reading here would indicate a poor ground connection. With the engine running, the voltage from the ignition terminal to ground should be between 6 and 7 volts. This is the left-hand terminal on top of the Startix. Connect one voltmeter test lead to this terminal, connect other voltmeter test lead to frame of car for this test. With the engine idling, voltage from the generator terminal to ground should

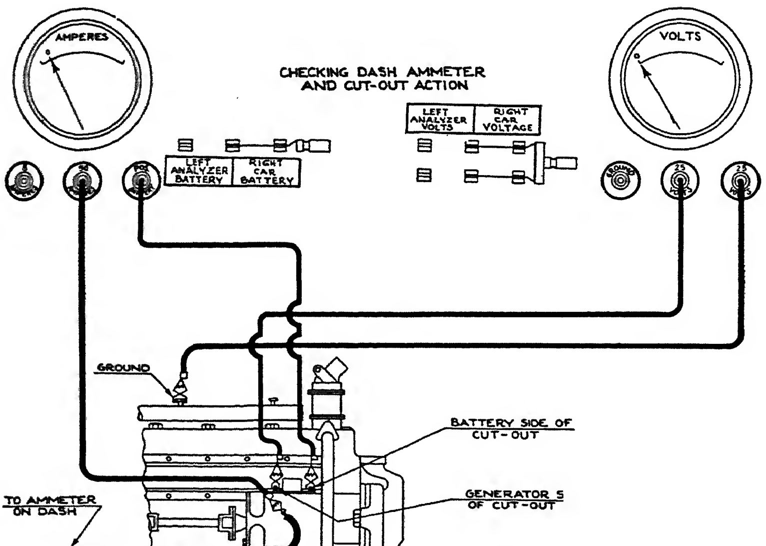


Fig. 10. Generator, Dash Ammeter, and Cut-Out Relay Test Connections

be 2 volts or more, and $6\frac{1}{2}$ to $7\frac{1}{2}$ volts when the engine is speeded up and generator is charging. This is the right-hand terminal on top of the Startix. Connect one voltmeter test lead to this terminal. Connect other voltmeter test lead to frame of car for this test.

Voltage between battery terminal and Startix terminal should be between 6 and 7 volts while starting motor is not operating. (The battery terminal is the large terminal at the bottom of the Startix. The starter terminal is the large terminal on the front of the Startix.) Voltage should not be more than one volt while the Startix is operat-

ing. Connect one voltmeter test lead to the battery terminal. Connect other voltmeter test lead to the starter terminal for this test. If these readings are obtained and Startix does not function, the entire unit should be replaced.

Generator Test. When adjusting the generator charging rate, always refer to the factory specifications for charging rate specifications. Do not depend on the car ammeter but use the ammeter on the test panel. The generator should be connected and the following tests made.

Disconnect the generator lead at cut-out relay terminal (battery side). Connect the ammeter test leads to 50-ampere and positive battery terminals on test panel as shown in Fig. 10. Connect one ammeter test lead to relay terminal (battery side). Connect other ammeter test lead to wire removed from the relay terminal. Close the lower battery switch to right. (These switches are located in the center of the test panel. This places the panel ammeter in series with the generator circuit.) Connect the voltmeter test leads to the 25-volt terminals on the test panel. Connect one voltmeter test lead to cut-out relay terminal (generator side). Connect the other voltmeter test lead to engine for ground. Close the voltage switch to right. Start the engine and observe readings on meters.

Check the car ammeter by comparing readings with the meter on the test panel. Test panel ammeter should show approximately $1\frac{1}{2}$ to 2 amperes more than the car ammeter. This is the current required for ignition (single coil) or 3 amperes where two coils are used. As engine speed is slowly increased from idling speed, the voltmeter readings should increase until a maximum of $7\frac{1}{2}$ to 8 volts is reached. At this voltage, the cut-out relay should close and voltmeter pointer will drop back to approximately $6\frac{1}{2}$ volts. At this time the ammeter should show a charging rate of from 3 to 5 amperes. Reduce the speed of the engine gradually. Charging rate should decrease and the ammeter will show from 2 to 3 amperes discharge, then drop back to zero.

The cut-out relay point should close at not more than 8 volts and open at from 2 to 3 amperes discharge. If these results are not obtained, relay is not operating properly and should be adjusted or replaced. A variation of $\frac{1}{2}$ volt or more between the battery and generator, after the generator has been charging at a maximum rate

for approximately 15 minutes, would indicate a high-voltage condition which may be due to loose or poor connections in the charging circuit. This must always be corrected. Adjust the charging rate, within safe maximum limit, to suit driving conditions of car operation so as not to overcharge battery or allow it to become discharged.

To Check Cut-Out Relay. Remove the voltmeter test lead from the frame of the car or engine, and connect to relay terminal (battery side). All other connections remain the same. This places the voltmeter directly across the cut-out relay terminals. Voltmeter should

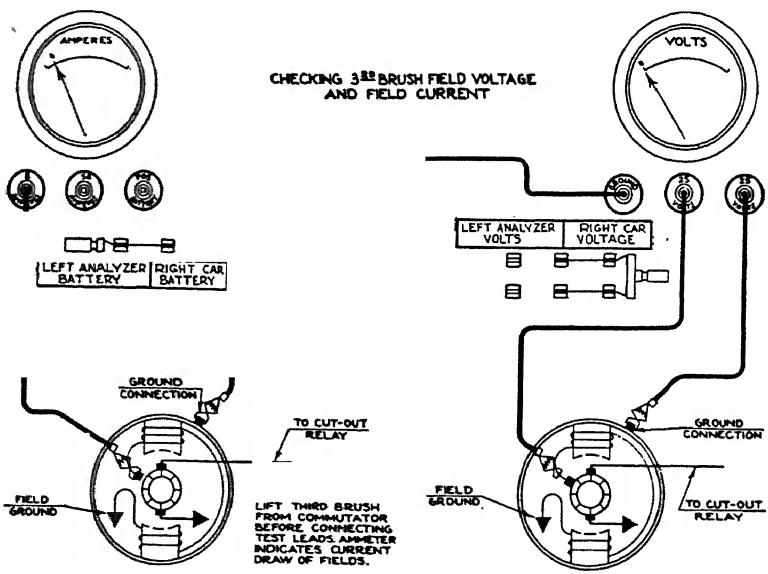


Fig. 11. Generator Field Test Equipment

show 6 volts with engine not running. Start the engine and run at idling speed. Increase the speed gradually and watch the readings on the voltmeter. As generator speed increases, the voltmeter reading across the relay will decrease, showing a reverse reading just before the points close. The pointers should then drop back to zero. If a reading is obtained with the points closed, it indicates that there is poor contact at the relay points. Relay should be repaired or replaced.

To Test Generator Field Coils. Connect the ammeter test lead to 8-ampere terminal, Fig. 11, on test panel. Close the battery

switch to the left. The generator third brush should be lifted or otherwise insulated from the commutator. This is the adjustable brush which controls the charging rate of the generator. Connect one ammeter test lead to the frame of the generator. Connect other ammeter test lead to the third brush. Reading on ammeter will indicate the current drawn by the field coil. See factory specifications for necessary data.

To Test Field Voltage and Third Brush Regulated Generators. Connect voltmeter test leads to 25-volt terminals on the test panel. Close the voltage switch to the right. Connect one voltmeter test lead to the frame of the generator or engine. Connect other voltmeter test lead to third brush. (Third brush should be in normal operating position in contact with the commutator.) Start the engine. At idling speed the voltage should be approximately 5 volts. As speed is increased, the generator charging rate increases. During this period, the voltage at the field will remain practically constant. At peak of the charging rate the voltage at the third brush will decrease as the engine is speeded up, with a resultant decrease in generator charging rate.

Visual Inspection. Visual inspection of the generator shows condition of commutator and brushes. In some cases worn bearings can also be checked during this inspection. If the commutator or brushes are worn or if the bearings are worn, the generator should be removed from the car and necessary repairs made. This is very important as the generator is the source of supply upon which all electrical units of the car depend. This inspection should include a check of the fan belt if the generator is belt-driven. Any belt that is oil-soaked or stretched beyond the take-up point should be replaced.

Spark Plug Test. Warm up the engine to the average normal operating temperature. Don't test spark plugs in a cold engine. Set the throttle allowing the engine to idle smoothly at low speed. Connect the high-tension lead with the red insulator to right-hand, high-tension terminal on the panel, Fig. 12. Connect the high-tension lead with black insulator to the left-hand, high-tension terminal on the panel. Connect the lead with red insulator to spark plug, connect lead with black insulator to ground or metallic part of engine. Set the pointer on spark gauge to "spark-plug line" on spark gap dial. This amount of gap represents properly spaced spark-plug electrodes

in engines of normal compression. In high-compression engines the spark gap should be opened wide.

If the spark-plug gap is too wide or electrodes are burned, causing a high resistance, the spark will jump across the gap in the spark gauge instead of across the electrodes in the plug. In case the plug is fouled, there will be no flash in the Geissler tube. The remedy is to correctly space the electrodes in accordance with specifications recommended by the spark-plug manufacturers. If the spark-plug

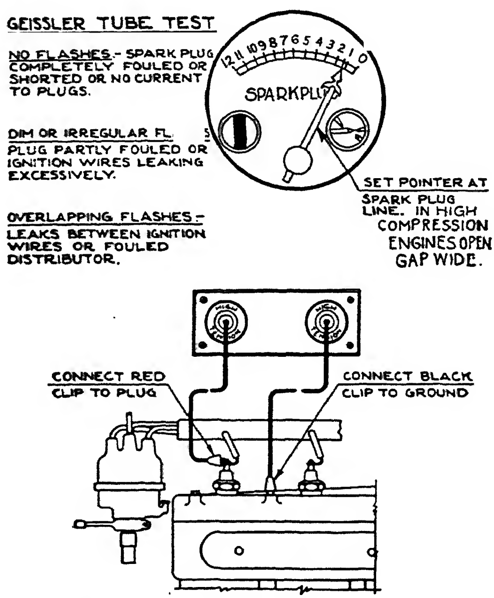


Fig. 12. Spark-Plug Test Equipment

electrodes are adjusted properly and are not burned, the spark will jump across the spark-plug electrodes and not in the spark gauge, showing that the spark plug is in good condition. In order to make an accurate analysis of the plugs, the distributor, coil, condenser, and high-tension cables must be in good condition. A double flash in the Geissler tube indicates a defective distributor cap or ignition cable.

When testing twin ignitions such as Nash or Stutz, disconnect the opposite side of the spark plugs before making tests. This can be done by removing the high-tension cable from the distributor cap

which fires the sides to be disconnected, and grounding this cable on the engine to protect the ignition coil providing current for this set of spark plugs. Motor car engineers recommend replacement of spark plugs after 10,000 miles of service for two reasons—performance and economy.

The foregoing instructions do not apply to cars equipped with radio. Where suppressors are used, the plugs can be tested by eliminating the suppressors by connecting the test lead direct to the spark-plug terminal under the suppressor. With the radio plug in good condition, the light in the Geissler tube will be dim, but the same for all plugs. Always check the spark plugs against the manufacturer's specifications and for "heat range" chart to determine if proper spark plug is being used.

Compression Test. This test should be made with the engine at normal operating temperature as the parts are then expanded to normal working condition. The compression test is made with all spark plugs removed and with wide-open throttle. On twin ignition such as Nash or Stutz, remove plugs on one side of engine only. Insert the proper adapter in cylinder, tighten moderately with a wrench (not too tight). Attach red compression hose, Fig. 13, to adapter in cylinder, hand tight. Do not use a wrench.

Use the starting motor to turn engine over several times until compression gauge shows highest reading, or until no further appreciable movement of the pointer is indicated. Record this reading. Test each cylinder in like manner. Compare results of the tests. A variation of 3 to 6 pounds compression in the various cylinders is satisfactory; however, a difference of 10 pounds less than the average indicates a cylinder with low compression and the cause of the low compression may be determined by further tests.

To distinguish between piston-ring leakage and valve leakage, remove the adapter and pour about a tablespoonful of heavy oil on top of the piston. Replace the adapter and compression hose and repeat the compression test. The oil temporarily seals leakage past the piston rings. Note whether the compression reading is approximately the same as before, or whether it is higher. If compression is the same, it indicates that rings are tight but the valves are leaking. If the compression reading has increased 10 pounds or more over first reading, it indicates that there is leakage past the piston rings.

Example. In an engine with a factory rating of 90 pounds, if one cylinder shows only 60 pounds but after sealing, that cylinder shows from 75 to 90 pounds, the condition indicates worn, broken, or poorly fitted rings. If, after sealing, the compression reading shows only from 4 to 6 pounds increase, it indicates bad valves in that cylinder. A low even compression in two adjacent cylinders sometimes indicates a

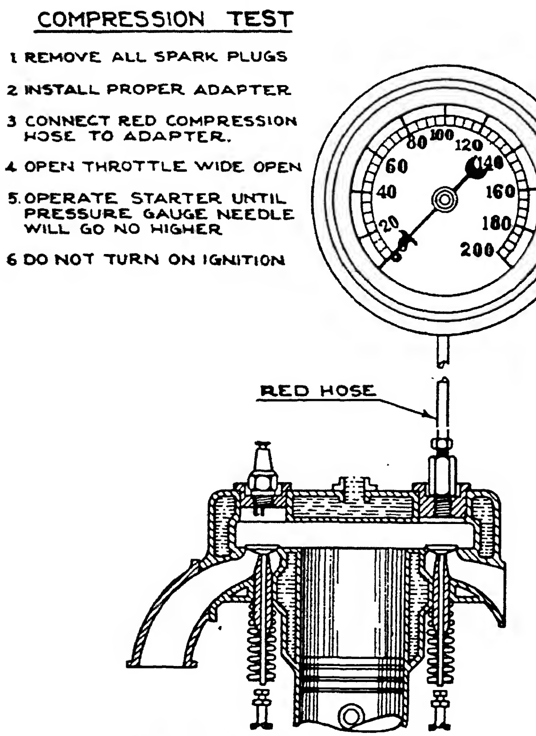


Fig. 13. Compression Test Equipment

leaky head gasket between these cylinders. This should be checked before condemning the valves or rings.

Note. The importance of the foregoing test is to determine variations in the compression between cylinders and not the absolute readings. It is not so important how high the compression is, but how uniform in each cylinder.

Notes on General Ignition Test. In making the general ignition test, the vacuum hose should be connected at the same time. That

is, make one operation of this job by connecting the ammeter in series with the contact breaker of the ignition distributor, the voltmeter at the ignition coil, the spark gap in series with the ignition coil, and the vacuum meter to the intake manifold. Having made these connections, the operator can see at a glance the true condition of the engine when it is started.

If the vacuum (see Fig. 13) shows 28 to 30 points without fluctuating, it shows that the compression is high and even. If the vacuum is low—25 to 27 and uneven, the compression is low and uneven. A complete test should be made to determine the cause for low compression, namely—carburetor adjustment, burned valves, improper tappet adjustment, worn rings and cylinder walls, before any promise is made to better the performance of the engine.

After the installation of new spark plugs, coils, points, and wiring harness, the vacuum meter can be relied upon to indicate engine condition because vacuum depends upon the same parts that control compression. In other words a set of pistons that will not create or suck a high vacuum will not pump a high compression. This also applies to valves—if they will not hold a vacuum they will not hold compression.

The vacuum meter acts as a very sensitive tachometer and will indicate the slightest variation in engine speed. So before the breaker contact points are condemned because of a fluctuating reading of the ammeter, it is essential that the operator know that the engine is running evenly. If the engine speed varies, the ammeter in the breaker-point circuit will vary with the engine speed. This is very often attributed, erroneously, to poor breaker-point action. Thus by using the vacuum the operator has a double check on the complete power plant.

Procedure for General Ignition Test. Connect the voltmeter test leads, Fig. 14, to 25-volt terminals on the test panel. Connect one of these leads to the battery side of the ignition coil. Connect the other test lead to the frame of the car or engine for ground. Disconnect the wire from the ignition coil on the distributor housing terminal. (In cases where electrolock is used, disconnect distributor lead at ignition coil terminal.) Connect ammeter test lead to 8-ampere terminal on test panel. (The ammeter test leads can be identified as being of the smaller over-all diameter and with large test clips in

square rubber insulators.) Connect one ammeter test lead to the distributor terminal (in cases where electrolock is used connect to coil terminal). Connect the other ammeter test lead to the distributor wire which was disconnected from the coil or distributor. (This places 8-ampere meter in series with primary circuit of the coil.)

Remove the high-tension cable from the center of the distributor cap. Connect the two high-tension test leads to the test panel. Connect the lead with red terminal to right-hand high-tension terminal on test panel and lead with black terminal to left-hand high-tension

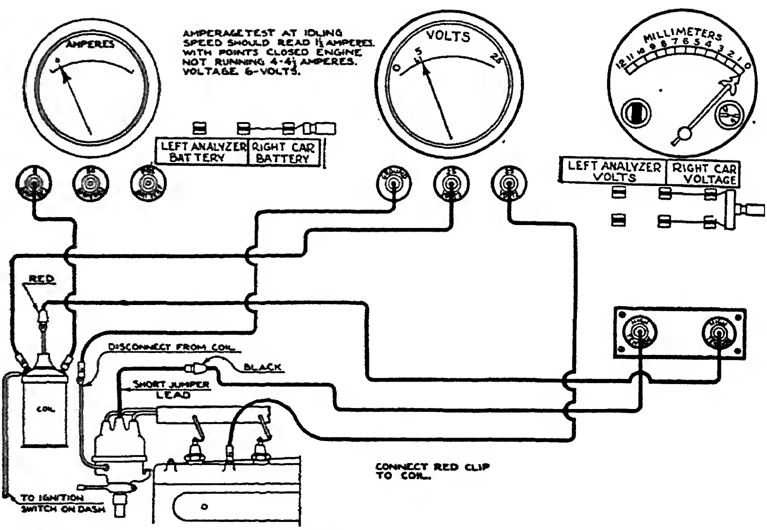


Fig. 14. General Ignition Test Equipment

terminal. Then connect the high-tension test lead with the red terminal to high-tension cable removed from center of distributor cap and the high-tension test lead with black terminal to the center of the distributor cap. (The high-tension leads referred to may be identified as being of the largest over-all diameter with small clips covered with short rubber insulators.) The black hose is the vacuum hose. Connect this hose to the intake manifold or as close to the intake manifold as possible.

Caution. Be sure the connection is tight and the hose is not kinked. See that suction exists at the point where connection is made.

Be sure that the washer is properly placed in hose adapter connection before making hook-up. Set the pointer on spark gauge at zero. Close the ignition switch and note voltmeter and ammeter readings. Should voltmeter register backward or reverse reading, reverse positions of voltmeter test leads at test panel. (With test leads in proper position, ignition switch closed and distributor points closed, Fig. 15, the voltmeter should read approximately 6 volts, not more than $\frac{1}{2}$ volt less than open circuit battery voltage.) If the reading is less

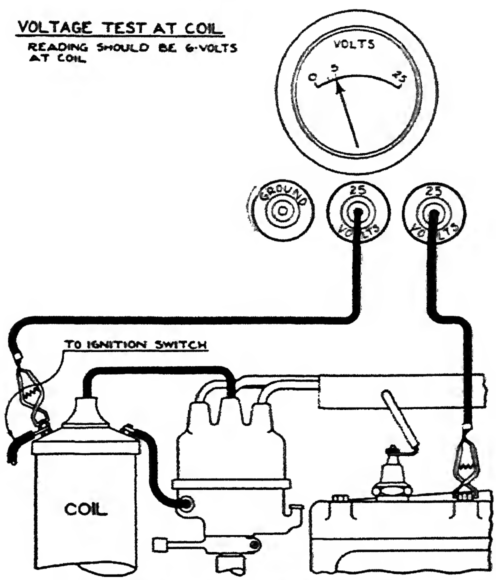


Fig. 15. Equipment Used in Determining Voltage at Coil

than 6 volts there is a loose or corroded connection between the coil and battery.

If the ammeter, Fig. 14, reads zero, turn the engine by hand until the distributor points are closed and then note reading. If the meter reads in reverse direction (to left) reverse ammeter terminals at test panel. Reading should be 4 amperes or more. If less, check for loose connection, poor ground or trouble in the distributor circuit.

Start engine and run at idling speed until normal operating temperature is reached. Note vacuum meter, Fig. 26. If reading fluctuates, endeavor to steady by carburetor adjustment. Open spark

gauge to maximum point at which spark will fire without missing across gap in spark gauge. Check spark-gap setting with coil chart. If spark gauge is set within $1\frac{1}{2}$ millimeters of factory specifications for particular coil as shown under heading cam angle 20 degrees, coil should be regarded as satisfactory unless subsequent coil tests prove otherwise. If coil will not fire steadily without missing with spark gauge set within $1\frac{1}{2}$ millimeters of standard setting, as shown by test coil chart, coil should be thoroughly tested as per ignition coil test.

An irregular spark indicates that either the coil or condenser (or both) are weak, bad breaker-point condition, or poor connection between distributor housing and engine block. No coil should be condemned without making a thorough and separate coil test. Note ammeter reading. Ammeter reading should show, approximately $1\frac{1}{2}$ to 2 amperes and the needle should remain steady. If reading is less than $1\frac{1}{2}$ amperes, or more than 2 amperes, it indicates bad contacts or trouble in the ignition circuit. If the ammeter hand fluctuates and vacuum gauge is steady, it indicates ignition-distributor trouble.

The general ignition test as outlined is not in itself a definite and conclusive test. Readings of the voltmeter, ammeter, and vacuum meter should clearly prove to the operator whether or not some definite trouble exists in the ignition system and engine. The general ignition test is employed to quickly determine those cases where trouble exists and to permit the operator to proceed with further individual tests to definitely locate and correct trouble indicated. Regardless of the fact that the general ignition test may indicate fairly good operative condition, it is always advisable for the operator before definitely stating that the ignition system is in proper condition to test specific units in the following order of procedure—distributor—ignition coil—condenser—ignition cable.

Ignition-Distributor Test. In the case of a distributor having two sets of breaker points, it is of utmost importance that they be adjusted to open and close at proper intervals. Setting these points accurately is termed "synchronizing." Ignition-distributor troubles can be classified as follows: breaker points not properly synchronized; breaker points burned or pitted; worn cam, making correct setting of the breaker points impossible; worn bearing, making correct setting of breaker points impossible; bent shaft, making correct setting of the

breaker points impossible; burned or cracked rotor; burned or cracked cap; worn or sticking automatic advance mechanism; poor ground connection.

The ignition distributor must be mechanically and electrically correct if the engine is to develop its maximum power. See factory specifications for correct breaker-point setting. A worn cam, worn bearings, or bent shaft is indicated by difference in breaker-point gap as the cam is rotated on the distributor test fixture. Burned or pitted points can be seen by making a visual inspection. Bad contacts generally are indicated by ammeter reading when making general ignition test. Burned or cracked cap or rotor can be seen, at times, by visual inspection or such trouble is indicated by a double flash in the Geissler tube. (See ignition-cable test and spark-plug test.) Remove the distributor cap and examine it thoroughly for cracks or burned condition.

Note. When making spark-plug test double flashes in Geissler tube are an indication of defective distributor cap or ignition cable. (See ignition cable test.) Remove and examine the rotor for cracks or burns. If "trailing" edge on rotor contact shows excessive burning, the rotor should be replaced. Inspect the breaker points for burned or pitted conditions and test for proper voltage as follows. Connect one 25-volt test lead to the breaker arm, connect another 25-volt test lead to edge of distributor cap. With the points closed, voltmeter should read zero. Any reading with breaker points closed indicates bad electrical contact and breaker points or weak breaker-arm springs.

Remove 25-volt test lead from edge of distributor housing and connect to engine, Fig. 16. With points closed, any reading on the voltmeter indicates poorly grounded distributor. Before removing leads, shake the distributor housing and note if this affects the voltmeter reading. Voltmeter may show zero when distributor is in one position and a slight reading when shaken. This condition must be corrected to obtain satisfactory distributor performance with the car on the road. Remove the test lead from the breaker arm and connect to distributor terminal on the outside of the distributor housing. Leave other test lead connected to the engine. (In case electrolock is used, connect first lead to distributor terminal on coil.) With points closed, voltmeter should read 0, unless testing through electrolock in which case reading not to exceed $\frac{1}{10}$ volt is permissible. Any

reading other than 0 ($\frac{1}{10}$ volt in case of electrolock) indicates loose connections between ignition coil and distributor.

Inspect for worn cam, worn bearings, bent shafts, worn or sticking advance mechanism. No replacement of ignition distributor parts (other than cap or rotor) or no distributor repairs should be

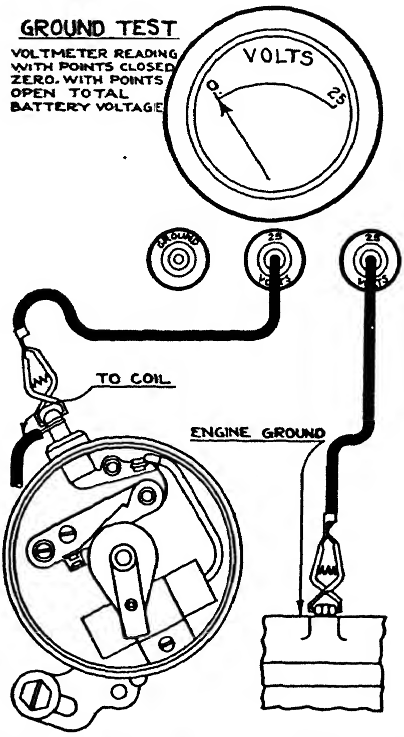


Fig. 16. Voltmeter Connections Showing Ground Test

made without removing distributor and checking with a proper ignition distributor test fixture.

Coil Testing Notes. The ignition coil can be tested either in position on the car, or the coil can be removed and placed on the equipment for testing. In the latter case, placing the coil on the "ground plate" grounds the coil. For example, the two coils in the chart, Fig. 20, showing connections for comparative coil test (where coil from car is tested against a new coil) of the same type are shown

on the ground plate. In order to make a proper test of an ignition coil, it is first necessary to heat it to its normal operating temperature because of the fact that a defective coil, when cold, in many cases will show a better spark than a coil in good condition heated to operating temperature. The reason for this is that the resistance

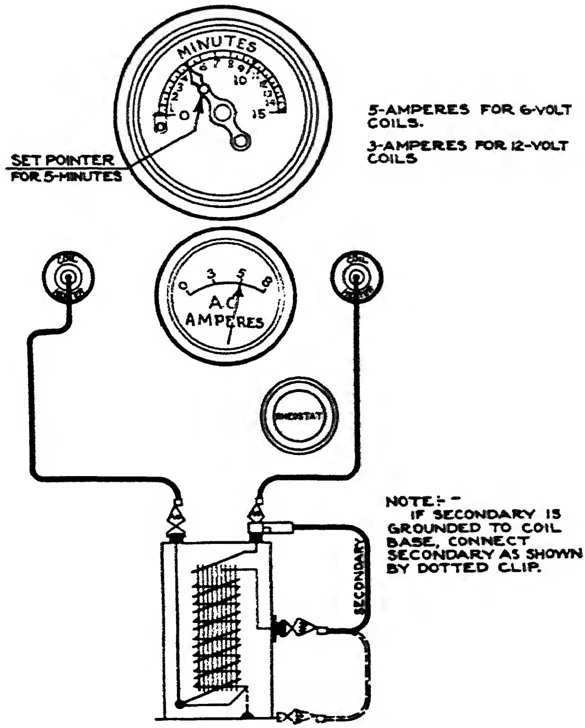


Fig. 17. Set-Up for Heating Coil

increases with temperature rise. Factory specifications are based on tests made with coil at operating temperature.

Heating Ignition Coil. Disconnect both primary wires from the ignition coil. Connect the test leads to terminals on the test panel lead marked "coil heater," Fig. 17, and to primary or low tension terminals of coil. Close the time switch by moving the lever to the right as far as it will go. This sets the switch for five (5) minutes. Set rheostat for five (5) amperes A.C. for 6-volt coils; three (3) amperes

for 12-volt coils. Connect short jumper lead to secondary or high-tension terminal of coil. Touch base of coil with the other end of this jumper. If spark is caused when lead touches coil base, it should be connected here for coil heating operation. If spark is not obtained at coil base, the jumper lead should be connected to either one or the other of the low-tension coil terminals. On cars coming in for a test and where the engine has been in operation it is not necessary to heat the coil before test. The coil will be at the correct operating temperature unless the engine has been in operation for 30 minutes

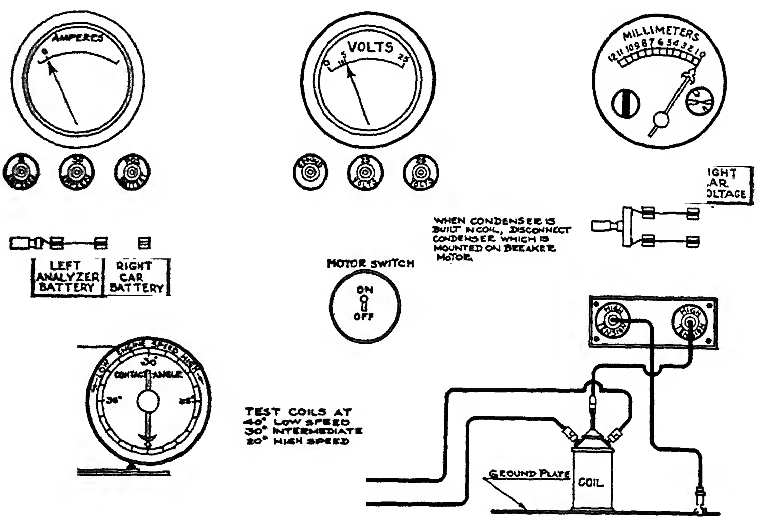


Fig. 18. Equipment for Testing Ignition Coil

or more. To adjust rheostat, Fig. 17, for above ampere flow, turn rheostat knob and observe ammeter which is located at top center of panel. When time switch opens and bell rings the coil is ready for test.

Testing Ignition Coil after Heating. After the coil is heated, disconnect all wires from coil. Connect one test lead, Fig. 18, to positive-battery terminal on test panel or on motorized breaker-unit base. Connect other ammeter test lead to breaker terminal on test panel, or on motorized breaker-unit base. Connect other ends of test leads to the low-tension terminals of the coil. Either test lead may be

connected to either coil terminal. Connect one voltmeter test lead to ground terminal on test panel or base on motorized breaker unit. Connect other end of voltmeter test lead to base of the coil. Connect high-tension test lead with red insulators to right-hand high-tension terminal on test panel and connect other end of this lead to high-tension terminal on coil. Connect other high-tension test lead with black insulators to left-hand high-tension terminal on test panel and connect other end of this lead to edge of ground plate on top of bench.

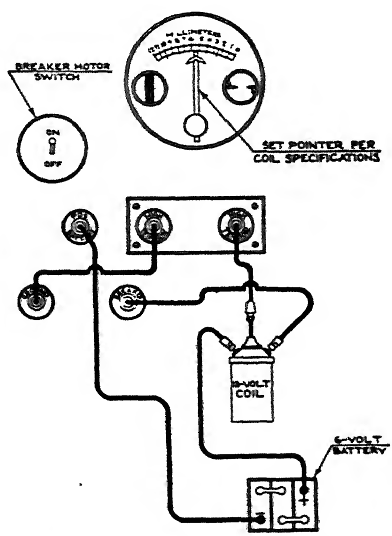


Fig. 19. Connections for 12-Volt Coil Test

Note. In making test on car keep high-tension leads separated at least 6 inches and keep them clear of car fender. Always use high-tension lead insulators.

Close both battery switches to the left (this places the analyzer battery in the circuit). Observe voltmeter. Close switch to run motor of the motorized breaker unit fixture. Consult charts following for specified millimeter gap for make and type of coil being tested and adjust spark gap on test panel accordingly. Test coil at 20, 30, and 40 degrees contact or cam angle corresponding to high, medium, and low engine speeds respectively. Failure of coil to fire regularly across

gap specified by ignition manufacturer indicates that the coil is weak. In this case, a new coil should be recommended.

Voltage Test at Coil. Connect voltmeter test leads, Fig. 15, to 25-volt terminals on panel. Connect other ends of test leads to battery side of coil to ground on engine. The reading should be 6 volts for a 6-volt coil. The test for a 12-volt coil is shown in Fig. 19.

Ground Test. Connect voltmeter test leads to 25-volt terminals on panel, Fig. 16. Connect other ends of test leads to distributor-housing terminal and to ground on engine. The voltmeter reading

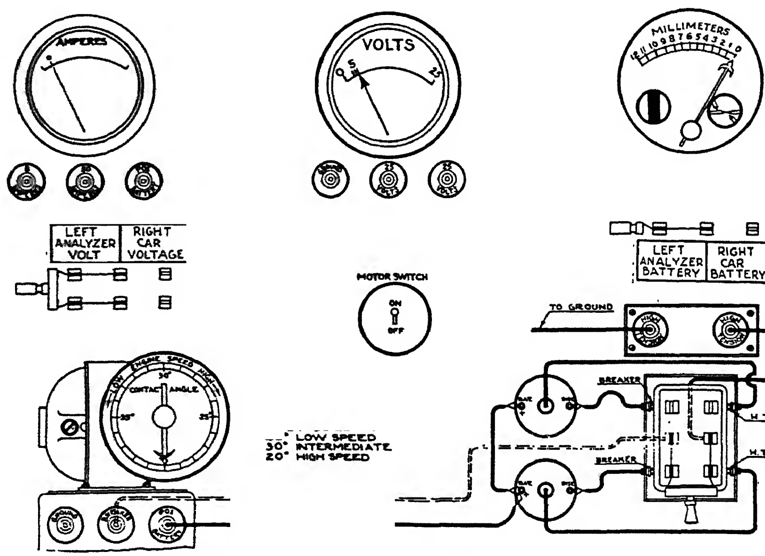


Fig. 20. Equipment for Comparative Coil Test

with ignition-distributor breaker points closed should be zero. With points open, total battery voltage.

Comparative Coil Test. In this test, Fig. 20, the coil from the car is tested against the same make and type of coil known to be efficient. The double pole switch at the right of the bench on the analyzer is used for this test and the connections are made as shown in the chart. By throwing the switch first to one closed position and then the other the comparative readings of the two coils can be noted. In the chart the two coils are assumed to be placed on the "ground plate" of the analyzer. However, the test can be made equally well with one coil

mounted on the car. In this case be sure to ground the engine or car frame to the analyzer.

Heating Two Coils. The two coils to be tested can be heated at the same time by connecting them in series with two terminals of the coil heater. In other words, run a test lead from one coil heater to one of the primary terminals on the coil. Then connect the other terminal of this coil to one of the primary terminals of the second coil. The remaining terminal on the second coil is then connected by means of another test lead to the second coil-heater terminal. It should be understood that the two standard coils furnished with the apparatus are not used for comparative coil test. The purpose of the two standard coils is to offer a ready means for checking the equipment to make sure that subsequent coil tests will be made with the necessary degree of accuracy.

Ford Coil. The method of heating the Ford "V-8" coil is shown in Fig. 21. The connections for testing this coil are shown in Fig. 22. The same test procedure applies as for other coils.

FACTORY COIL SPECIFICATIONS

Spark in Millimeters		Cam Angle		
		20° High Engine R.P.M.	30° Medium Engine R.P.M.	40° Low Engine R.P.M.
Auto-Lite Coils	Voltage			
CE (Auto-Lite)	6	5.5	6.75	9.5
CF (Auto-Lite)	12	4.5	5.25	6.5
CG (DeJon)	12	4.5	5.25	6.5
CAA (DeJon)	6	5.5	6.75	9.5
IG (Auto-Lite)	6	5.25	6.5	7.25
Delco-Remy Coils				
178-C	12	5.5	5.5	7.0
178-J	6	4.5	5.5	6.5
284	6	3.0	4.5	6.5
526	6	4.0	5.0	6.5
528	6	4.0	5.0	6.5
529	12	4.5	6.0	7.0
530	6	4.5	5.5	6.5
531	6	5.0	5.5	6.5
532	6	4.0	5.0	6.5
533	6	4.0	5.0	6.5
534	6	4.0	5.0	6.5
535-A	12	5.5	6.0	7.0

FACTORY COIL SPECIFICATIONS

Spark in Millimeters		Cam Angle		
		20° High Engine R.P.M.	30° Medium Engine R.P.M.	40° Low Engine R.P.M.
Delco-Remy Coils	Voltage			
535-J	6	4.0	5.0	6.5
537	6	4.0	5.0	6.5
2195	6	4.0	5.5	7.0
2197	12	6.5	7.0	6.5
2199	12	2.5	5.0	7.0
North East Coils				
5010210	12	1.0	2.0	5.5
5010338	6	4.5	5.0	7.0
5018864	6	4.5	5.5	7.0
5019232	6	4.5	5.5	7.0
5020274	6	4.5	5.5	7.0
5020285	6	4.5	5.5	7.0
5020332	6	4.5	5.5	7.0
5020333	12	1.0	4.0	6.0
5021000	6	6.0	8.0	8.5
5021106	6	6.0	8.0	8.5
5021438	6	4.5	5.5	7.0
5021670	6	6.0	7.5	10.0
5021671	12	7.0	8.0	10.0
5021904	6	6.0	7.5	10.0
5021998	6	6.0	7.5	10.0
5022002	6	6.0	7.5	10.0
5022293	6	6.0	7.5	10.0
5022314	6	6.0	7.5	10.0
5022324	6	6.0	7.5	10.0
5022325	6	6.0	7.5	10.0
5022390	6	6.0	7.5	10.0
5022636	6	6.0	7.5	10.0
5023130	6	6.0	7.5	10.0
5023221	12	7.0	8.5	10.0
5023599	12	7.0	8.5	10.0
5023601	12	7.0	8.5	10.0
5023640	6	6.0	7.6	10.0
5023660	6	6.0	8.0	10.0
5025063	12	7.0	8.5	10.0
5025430	6	5.5	7.5	10.0
5025431	6	5.5	7.5	10.0
5027936	6	7.0	8.5	10.0
5027942	6	7.0	8.5	10.0
5028275	6	7.0	8.5	10.0

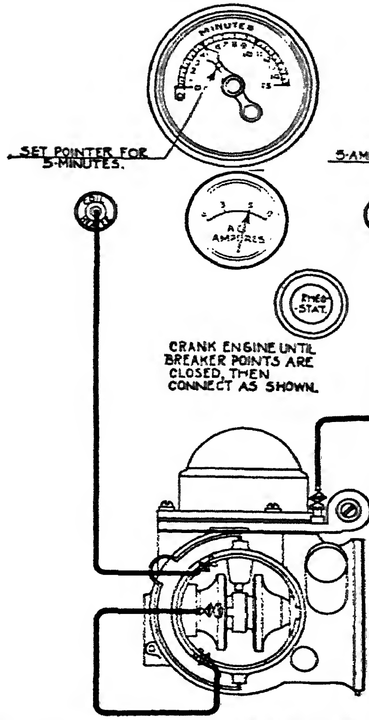


Fig. 21. Connections for Heating Ford "V-8" Coil While on Car

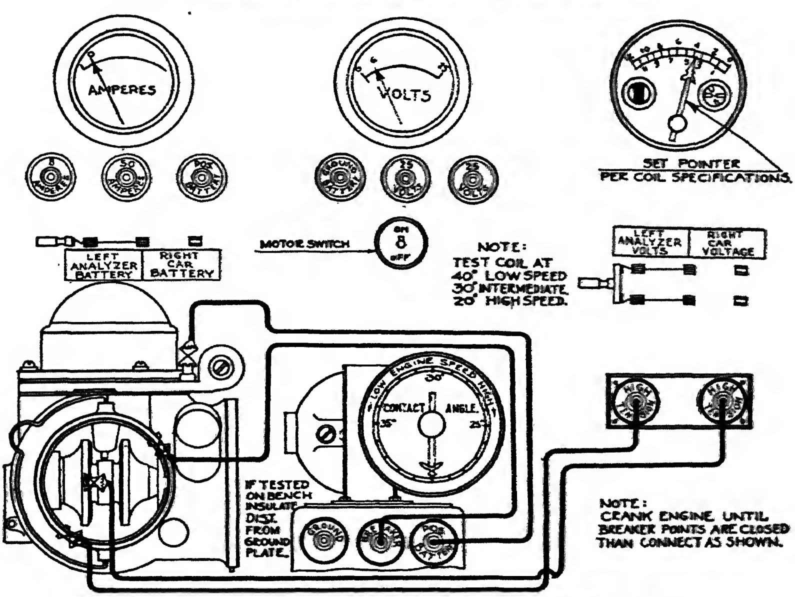


Fig. 22. Connections for Testing Ford "V-8" Coil While on Car

Condenser Test. Two voltages are provided for on this test. The short lead between the charge and discharge meters should be connected to the 350-volt terminal for condensers on 6-volt systems and condensers of low capacity such as used in vibrator horns and to the 500-volt terminal for condensers used on 12-volt systems. Connect test lead, Fig. 23, to plain terminal on condenser tester on test panel. This terminal is on the extreme right of the condenser tester, to the right and under the discharge meter. Connect other end of this lead to condenser lead. Connect another test lead to ground terminal on test panel. Connect other end of this test lead to condenser bracket.

Be sure that distributor points are open. Place piece of fiber between breaker points while making condenser test. Leave ignition switch open except with electrolock when battery lead is disconnected from coil and ignition switch is closed to "on" position. Hold the condenser tester switch closed for 10 seconds, using the 350-volt tap for 6-volt systems and 500-volt tap for 12-volt systems. (See condenser chart card, Fig. 23, for correct readings.)

A good condenser will show approximately equal readings on both the charge and discharge meters of condenser tester. A variation of 3 points is permissible. Using 350-volt tap charge and discharge, readings are as indicated on chart. Discharge side is always lower than charge side. A weak condenser is indicated by an appreciably lower reading on the discharge meter than that on the charge meter. If reading is obtained on charge meter only, it indicates a shorted condenser. Before condemning condenser disconnect condenser from circuit and test separately to determine whether short is in condenser or in the condenser circuit. If no readings are shown on either meter, the condenser is open. In any of these three cases, the condenser should be replaced with a new one as specified by the manufacturer. A poor condition of the contact points is not always indicative of a faulty condenser. Excessive voltage, poor grounds, or too long a cam angle may cause the same condition.

Ignition Cable Test. Disconnect the ignition cable from the spark plug. Connect the lead with red insulator, Fig. 24, to end of ignition cable; connect lead with black insulator to spark plug from which the cable being tested was removed. Set the pointer on spark gauge at zero. Start the engine and run at idling speed. Set the pointer on spark gauge to one millimeter less than the maximum gap

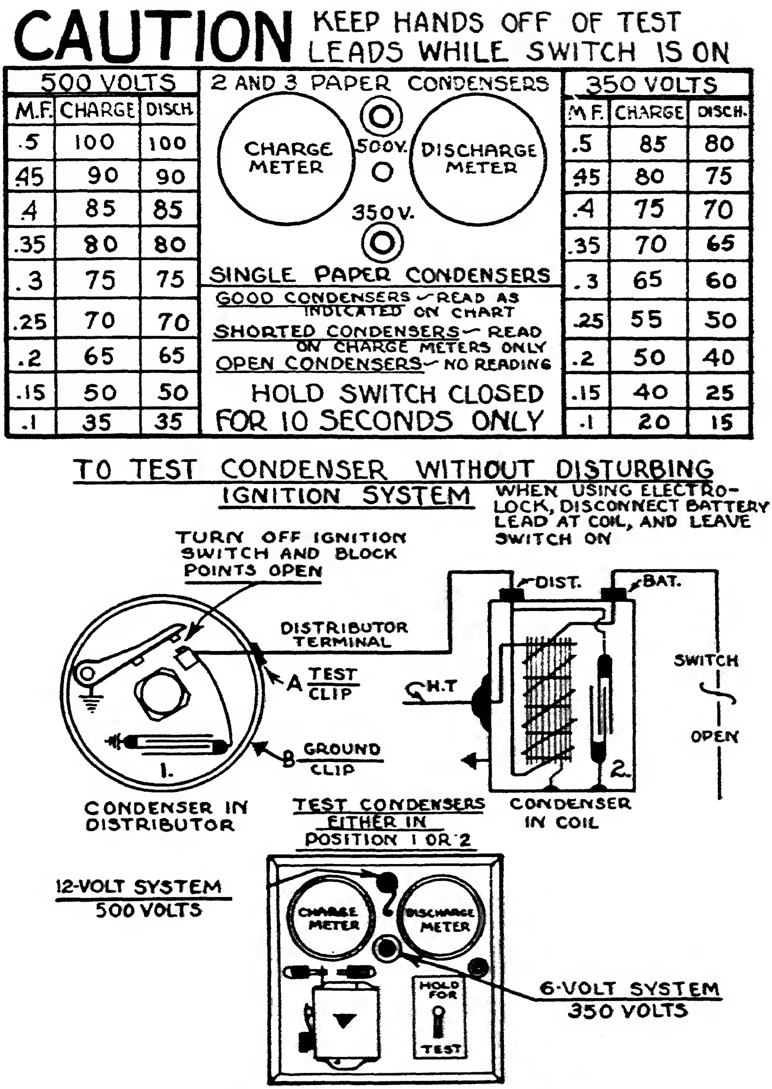


Fig. 23. Equipment for Condenser Test

at which the coil operates without missing at idle speed. If ignition cable, ignition distributor, and rotor are in good condition, the spark will jump across gap without missing and the flashes in the Geissler tube will be clean cut. On installations where long high-tension cables are housed in a manifold, the gap should be set two millimeters less.

If the spark is irregular or over-lapping, flashes occur in Geissler tube. Disconnect test lead from spark-plug cable and connect high-

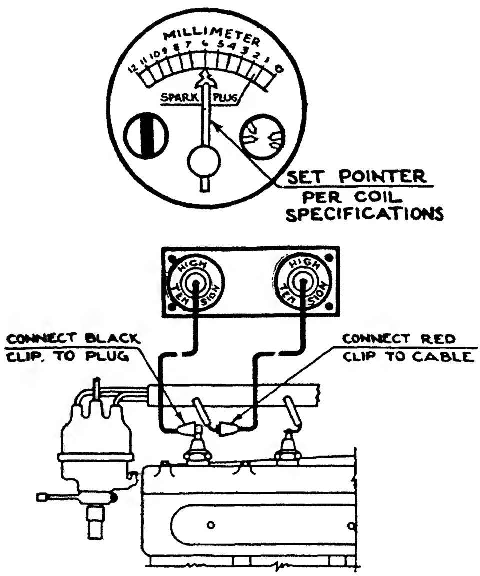


Fig. 24. Equipment for Making Ignition Cable Test

tension test lead from panel to the ignition distributor, eliminating spark-plug cable entirely. Connect by means of short jumper lead. The other test lead remains connected to spark plug. If this eliminates the miss, the spark-plug cable is defective. If the miss is still there, the distributor cap or rotor is defective. Test each spark-plug cable in this manner. Also test the high-tension cable leading from the coil to the distributor cap.

Caution. Check all high-tension terminals. Be sure all terminals are tight and have good contact with wire. Refer to Fig. 25.

Vacuum Test. Connect the vacuum hose to the intake manifold, Fig. 26. Make connection as close to the intake manifold as possible. The black hose on the equipment is the vacuum hose.

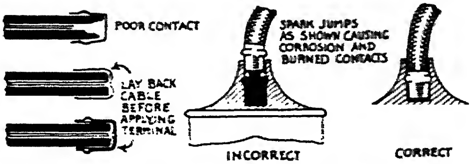


Fig. 25. High-Tension Terminals

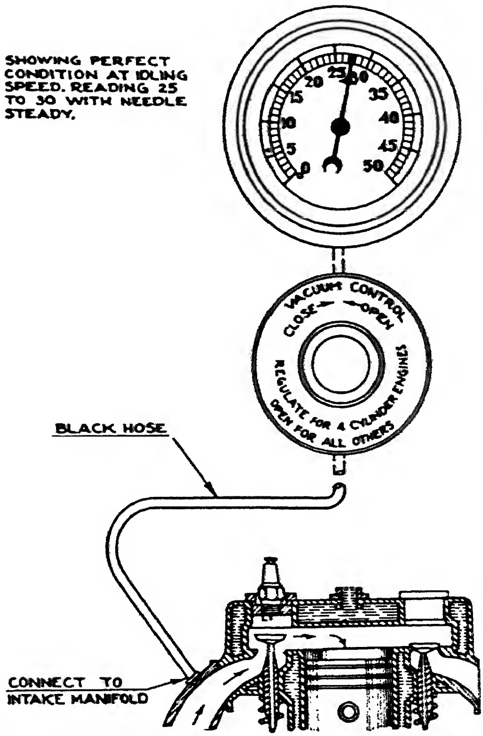


Fig. 26. Vacuum Meter Showing Reading During Vacuum Test

Caution. See that the washer is properly placed in the hose-adapter connection before making connection to manifold. Be sure that connection is tight, hose not kinked, and that suction exists at point where connection is made. On V-type engines using two intake

manifolds, make separate test on each manifold. Start the engine. Adjust the throttle butterfly valve and set idling adjustment on carburetor to get as fast an "idle" as possible. The spark must be fully advanced on engines with manual advance.

Vacuum Control on Test Panel. This is only used when testing four-cylinder engines. On this type of engine there is an uneven pulsation causing a vibration of the vacuum needle. Turn the knob to the right in "close" direction until the vibration ceases. When taking vacuum readings on any other engines, regardless of the number of cylinders, turn the knob to the left or "open" direction. If the engine is in perfect condition the needle of the vacuum meter remains steady, Fig. 26, between 25 and 30. (Vacuum readings will vary with altitude. See vacuum chart on the following pages for correct vacuum readings in different localities.)

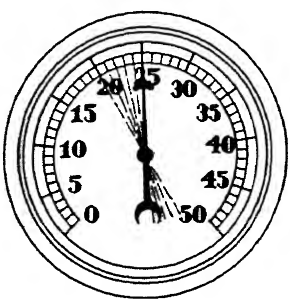


Fig. 27. Needle Motion Intermittent—Valve Sticky

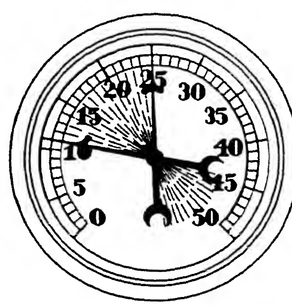


Fig. 28. Needle Drop Constant—Valve Burnt

Sticky Valve. Needle, Fig. 27, drops back intermittently whenever sticky valve or valves come into operation. To check this test, remove the vacuum-hose connection and inject penetrating oil into the manifold for temporary relief. For permanent relief install a Weidenhoff upper engine lubricator with the thermostatic control.

Burnt Valve. Needle, Fig. 28, has a constant drop whenever burnt valve or valves which are holding open come into operation. This action can also be caused by insufficient valve tappet clearance.

Weak Valve Springs. At idling speed, valves will seat properly and vacuum needle will remain steady between 25 and 30. When speeding up the engine the vacuum needle, Fig. 29, vibrates excessively, indicating weak valve springs.

Loose Valve-Stem Guides. When intake valve-stem guides are worn, a fast vibration of vacuum gauge needle, Fig. 30, at idling speed instead of a drop will be noted. This fast vibration disappears with the increasing speed of the engine.

Choked Mufflers. To check muffler conditions, speed up the engine several times in rapid succession and watch the action of the vacuum gauge needle. A clear muffler is indicated by a quick reversal

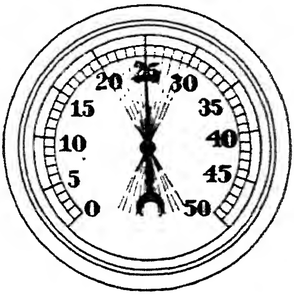


Fig. 29. Needle Motion Increases with Engine Speed—Valve Springs Weak

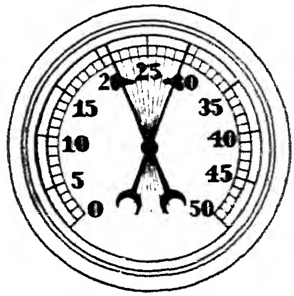


Fig. 30. Fast Vibration of Needle—Valve Guides Loose

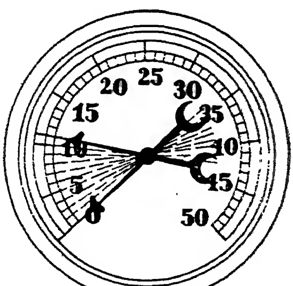


Fig. 31. Needle Action—Choked Muffler When Speeding Engine

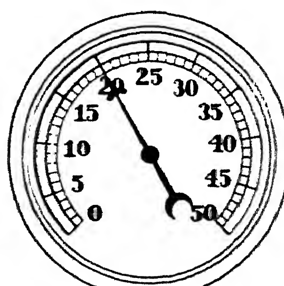


Fig. 32. Vacuum Needle Position—Late Valve Timing at Idling Speed

of the needle, Fig. 31. A choked muffler is indicated by a slow reversal of the needle. In some instances it will come back to ten only.

Valve Timing. If valve timing is late any appreciable amount, the vacuum needle, Fig. 32, will remain at approximately 20 and higher reading cannot be obtained. Fig. 33 shows a correct condition at engine idling speed. Reading on the vacuum gauge is 25 to 30 or more and the needle remains steady. If a condition, Fig. 34, exists, that is, a slow movement of the needle, adjust the carburetor to steady

the needle. Good compression in the cylinders is necessary for good vacuum test. Faulty conditions and poor compression will also result in a low vacuum reading.

Choke Test. Leave the ignition switch in "off" position. Close the throttle and turn the engine over with the starting motor. The needle should rise steadily and quickly to 25 or 30. If the needle stays around 5 to 8 it may indicate a burned riser tube, failure of throttle valve to close, or air leaks in the intake manifold system.

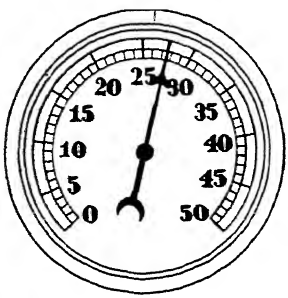


Fig. 33. Needle Position Showing Perfect Condition at Idling Speed—Reading 25 to 30 or More with Needle Steady

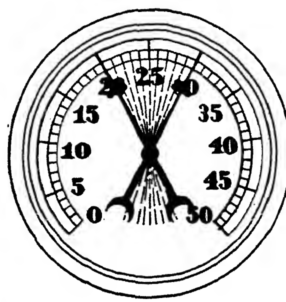


Fig. 34. Vacuum Gauge Showing Slow Movement of Needle—Adjust Carburetor to Steady Needle

VACUUM AND COMPRESSION READINGS
FOR
DIFFERENT ALTITUDES

Altitude Above Sea Level	Atmospheric Pressure	Vacuum Meter Reading	Compression Pressure
At Sea Level	14.7	28	64
1,000	14.1	26.5	59.5
2,000	13.6	25	57
3,000	13.1	23.5	55.4
4,000	12.5	22	51.2
5,000	12.3	20.5	49
6,000	11.6	19	46.5
7,000	11.2	17.5	44.3
8,000	10.8	16	42.1
9,000	10.4	14.5	40
10,000	10	13	37.9

Ignition Timing Test. In four-cycle internal-combustion engines it is very important to have the spark occur at the proper time in

relation to the position of the piston. This is of special importance in high-speed, high-compression engines. It takes a certain amount of time to ignite the compressed mixture of fuel and air; therefore, it is necessary to have the spark occur before the piston starts its downward stroke. This is necessary in order to get the maximum power out of each impulse. If the timing is late, a portion of the power is wasted as the spark occurs after the piston has started the downward stroke. If the timing is early, piston must complete the upward stroke against the resistance of the expanding gases already ignited, resulting in greatly reduced power and during the starting operation causing back fire. The use of a Weidenhoff Motor Gauge is recommended when timing.

Valve Timing. Valve timing is equally as important as ignition timing. Intake and exhaust valves must open and close at exactly the right points in relation to the pistons. The valves of the poppet-valve type of engine are operated by cams properly positioned on the cam shaft. This shaft is driven at one-half engine speed by gears or a chain from the crank shaft. Any wearing of the timing gears or sprockets, or stretch in the chain will result in late valve action. Maximum power output under these conditions is impossible. Overheating and high fuel consumption may result. The only remedy for this trouble is a new chain or sprocket, or both and new timing gears where cam shaft is gear-driven. If the valve timing is late to a considerable degree, it will show up when making vacuum test.

Carburetor Test. A carburetor cannot be adjusted properly unless all previous tests up to this point are satisfactory or the defects disclosed have been corrected. Good ignition, good compression, good spark plugs, and proper valve action are necessary for correct carburetor performance. A visual inspection should be made for gasoline leaks at connections and under carburetor bowl. Connect black vacuum hose, Fig. 35, as close as possible to intake manifold.

Note. This connection can be made most conveniently by disconnecting copper tubing used to operate windshield wiper. Start the engine and let it run at idling speed. The engine must be at normal operating temperature before adjustments are attempted.

With the carburetor properly adjusted, the pointer on the vacuum gauge remains stationary between 25 and 30. If the pointer shows a slow floating motion between 20 and 30, the carburetor

requires adjusting. To properly adjust the carburetor, turn the idling adjustment screw, either rich or lean until the pointer on the vacuum gauge reaches the highest possible point without vibration. This is the correct position for idling adjustment. Some engines are equipped with carburetors with both high- and low-speed adjust-

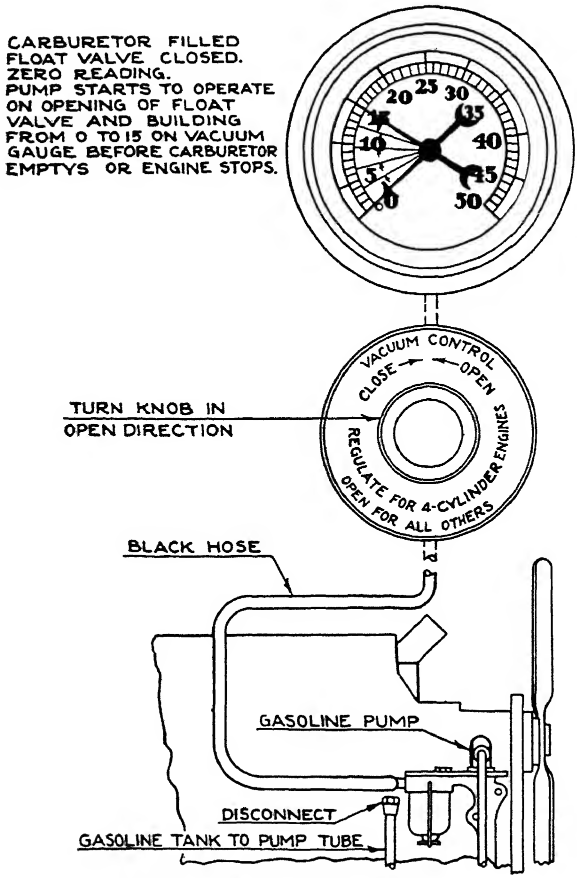


Fig. 35. Carburetor Test Equipment

ments. On these the high-speed adjustment should be made first. For high-speed adjustment advance the spark and speed the engine up to the equivalent of 20 or 25 m.p.h. Adjust to the highest reading obtainable on vacuum gauge without vibration. For low-speed adjustment, retard the spark and run the engine at idling speed.

Set the idling adjustment at highest reading obtainable on vacuum gauge without vibration.

Failure of Engine to Idle Properly. Failure of engine to idle properly may be due to: worn valve stem guides, uneven tension of valve springs, air leaks at intake manifold, leaking intake and exhaust valves, uneven compression due to worn piston rings, burned valves or sticking valves, and spark-plug gaps improperly set. Troubles in this group should be detected in previous tests on the motor analyzer.

Popping Back in Carburetor. Popping back in carburetor indicates weak mixture, insufficient gasoline supply, sticking valves, valves not seating (due to lack of clearance between push rod and valve stem), or incorrect ignition timing.

Exploding of Gases in Muffler. Intermittent spark due to incorrect adjustment of ignition-distributor breaker points or weak breaker-contact arm spring, worn distributor shaft or bearings, loose connections in ignition wiring, faulty ignition cables, or faulty spark plugs will cause explosion of gases in muffler. Troubles in this group should be detected in previous tests on the motor analyzer. Satisfactory carburetor adjustments are impossible if the carburetor internal parts are worn, if jets are stopped up or of improper size, or if repairs of any nature are required in the unit itself. In cases of this kind, the customer should be advised that repairs are necessary before satisfactory results can be obtained.

Lighting Test. A visual inspection should be made to determine if all lights are burning. All lamp connections should be checked to make sure they are making proper contact. All wiring connections must be tight to eliminate excessive voltage drop. A loose connection between the generator and the battery will result in high voltage and burned-out bulbs. Check the headlight lenses and reflectors. It is important that headlights be equipped with proper lenses. The name on the lenses and that on the lamp body should be the same otherwise the light will be neither legal nor satisfactory. Reflectors should be bright and clean. A tarnished reflector diffuses the light and destroys its effectiveness. Good connections, bright reflectors, correct lenses, and proper focus are essential to good lighting.

Windshield Wiper Test. The windshield wiper should be tested on every car. If the hose is hard and dry, it should be replaced.

Cracked hose connections result in loss of vacuum and unsatisfactory wiper operation. The wiper blade should be replaced if the rubber has lost its pliability. A hard blade will not wipe the glass clean and it will scratch the windshield. If the hose is in good condition and the wiper fails to operate as it should, the entire unit should be removed from the car and necessary repairs made at the bench.

Horn Test. Due to the mounting of the horn on many cars, it is practically impossible to get a satisfactory adjustment without removing the horn from the car. However, it is very important that all wiring connections are tight and that the wire is of sufficient size to prevent an excessive drop in voltage between the battery and horn. In cases where the standard equipment horn has been replaced with a larger horn, or where two are used in place of the original one, the car wiring may not be of sufficient capacity to deliver enough current to the horn or horns. A voltage test across the horn terminals with the horn button depressed will indicate condition of the wiring. A voltmeter reading, of at least $5\frac{1}{2}$ volts, should be obtained at the horn terminals.

Connect the voltmeter test leads to the 25-volt terminals on the test panel. Connect one voltmeter test lead to each horn terminal. On most cars the horn circuit is completed by a wire brought up to a button switch through the steering column. Space does not permit the use of heavy wire and in cases where the horn load has been increased (either by a larger horn or an additional horn) the drop in voltage is considerable. This trouble can best be overcome by the installation of a horn relay. If the voltage at the horn terminals is satisfactory ($5\frac{1}{2}$ volts) and the horn does not operate or have the proper sound, it should be removed from the car and repaired or adjusted at the bench.

Oil-Filter Test. The average useful life of an oil-filter cartridge is from 8,000 to 10,000 miles, depending on the size and type. The dirt and grit removed from the oil in the process of filtration is trapped in the cartridge and it has been definitely determined that in 8,000 and 10,000 miles of travel enough of this foreign substance has been collected to destroy the effectiveness of the filter. A new cartridge should be recommended in every case where the car has been driven over 10,000 miles since the last renewal. An oil filter kept in working condition will save the owner many times its cost

by removing abrasive substances from the oil. Besides this the same oil can be used for a long period of time.

Cooling-System Test. A visual inspection should be made of the radiator, water pump, fan, and fan belt. If the cooling system is not functioning as it should, the efficiency of the engine will be affected. If the pump is driven by a belt, the belt should be tight to prevent slipping. If stretched beyond the take-up point, it should be replaced. If the pump is leaking, the packing gland should be tightened or if this is impossible, new packing should be used. If the radiator leaks, repairs should be recommended. A free-flow test should be recommended if circulation through the radiator appears to be restricted. Hose connections should be checked. Improper water-pump lubricants are sometimes forced through the pump bearing into the water. This oil or grease has a harmful effect on the rubber hose. Radiator and pump hose connections should be renewed once a year.

ANALYZING IGNITION UNITS

Testing Distributor Heads. Since all four-stroke cycle engines fire once for every two revolutions of the crank shaft it naturally follows that the rotor of the ignition head must rotate at one-half crank-shaft speed. The distributors on all four-stroke cycle engines are geared 2 to 1. Consequently a four-cylinder engine fires once for every 90 degrees of distributor travel, a six-cylinder engine fires once for every 60 degrees of distributor travel, and an eight-cylinder engine once for every 45 degrees. The rotary oscillograph scale, Fig. 36, is divided into 360 parts corresponding to 360 degrees of a circle. Dividing 360 degrees by the number of cylinders of an engine gives the number of distributor degrees between sparks.

Regardless of the speed or number of sparks per revolution the spark will occur the same number of degrees apart if the ignition-distributor unit is in perfect condition. If, however, the cam is worn uneven or if the bearings have so much play that the cam is allowed to wobble, the sparks will vary in proportion to the amount of wear in the unit. If the distributor head has an automatic advance governor, the speed with which it begins to operate can be accurately checked on the fixture. Governors start to advance automatically at a speed of about 200 r.p.m. and reach a maximum advance at

from 1500 to 2200 r.p.m. These speeds vary with different makes of cars. On many of the more recent engines a vacuum spark con-

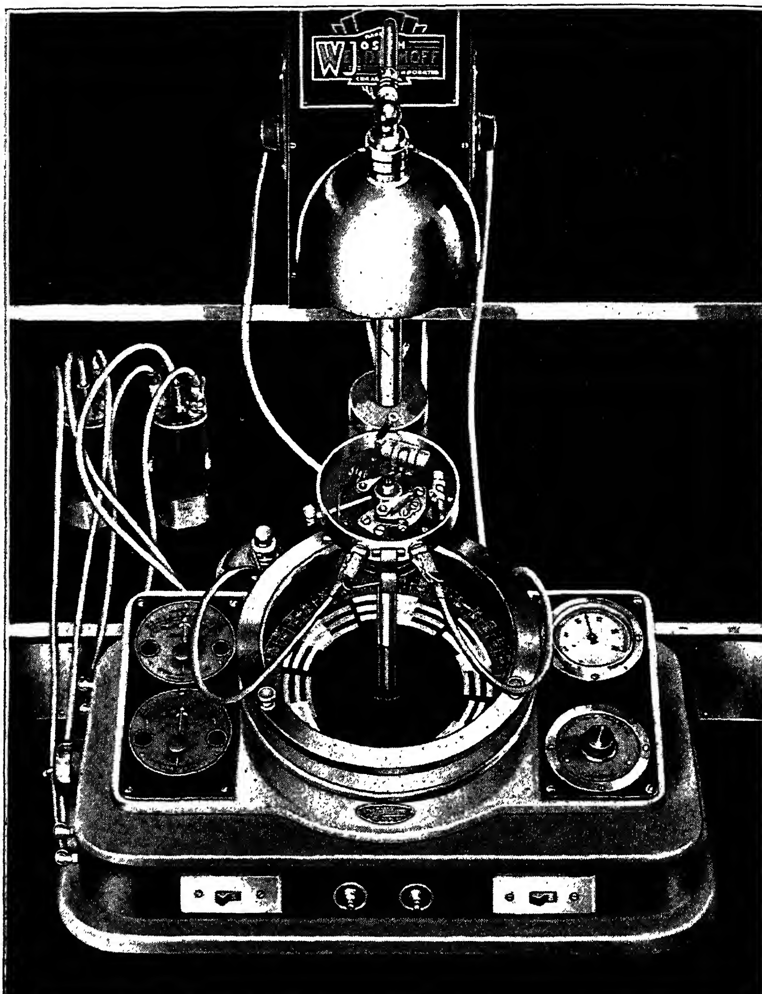


Fig. 36. Weidenhoff Oscillograph Ignition Analyzer

trol advances or retards the spark automatically according to the conditions under which the engine is operating.

Meaning of Cam Angle. The term "cam angle" as applied to ignition distributors, Fig. 37, is the number of degrees through which the cam travels while the breaker points are closed and the coil builds up a magnetic field in the primary which, upon the opening of the points, induces a high-tension current necessary in the sec-

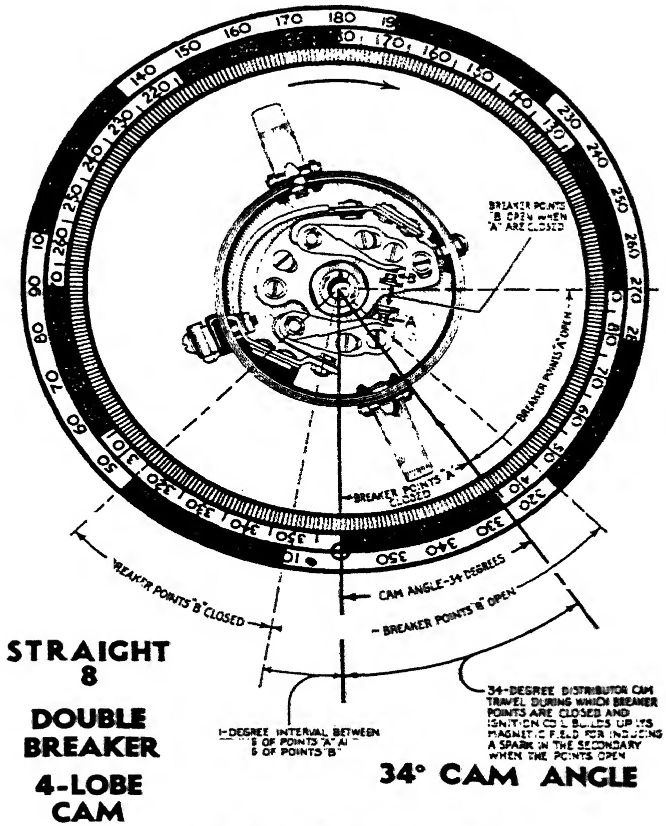


Fig. 37. Oscillograph Cam Angle
Example Applies to Studebaker Commander "8-70," 1931

ondary winding for a spark at the spark plugs. It will be evident at once that the cam angle does not change with the engine speed but the time factor does change. Thus a cam angle of—say 34 degrees remains 34 degrees at engine speeds of 1,000 and 2,000 r.p.m. However, at 2,000 r.p.m. the cam angle or that interval during

which the breaker points are closed consumes one-half of the time that it does at 1,000 r.p.m. engine speed.

Consequently with an increase in engine speed there is a corresponding reduction in time during which the breaker points are closed although the cam angle remains the same. To make this even more clear, suppose A and B travel a distance of 1 mile, A going at the rate of 30 m.p.h. and B at 60 m.p.h. B naturally travels the distance twice as fast as A or in other words, B consumes only one-half as much time as A, but the distance of 1 mile remains the same.

Mounting Ignition Distributor for Test. The distributor to be tested is placed in the jaws of the clamp on the vertical post of the fixture, Fig. 36, being held in place by the wing nut on the side of the clamp. The clamp itself can be adjusted for various heights on the post, being locked in place by a thumb screw. Select the proper adapter to fit the bottom of the distributor shaft. The lower end of the adapter is connected to the upright shaft of the rotary oscillograph. A three-jaw chuck furnished with the fixture can also be mounted on the end of the shaft for driving distributor shafts on which the adapters cannot be used. In connecting the distributor shaft, Fig. 36, to the shaft of the fixture allow the assembly to "bottom" on the fixture shaft and then slightly raise the distributor clamp before tightening the thumb screw. This removes the weight from the fixture shaft.

Operation of the Ignition Analyzer. With the distributor properly mounted and connected and with both switches closed, the rotary indicator, on which are mounted the two neon tubes, revolves; the speed being governed by the regulator on the front of the base. Looking into the scale cup the operator sees a series of red and blue flame flashes in the path swept by the tubes, caused by making and breaking the circuit in the distributor by the breaker points. The end of these flashes in the direction of rotation represents the points at which the cylinders fire, in other words, where the points open. The arcs of light (cam angle) show the time intervals during which the breaker points are closed. On the right side of the oscillograph unit, Fig. 38, there are two switches, one of which lights the red light in the disc when the points are closed, while the other controls the blue light. Adjust the distributor on test to the cam angle specified by the distributor maker. Theoretically, the flame flashes of

light or cam angle should be exactly alike so far as the number of degrees is concerned and this is also true of the spaces or firing intervals between the flashes. Cam or bearing wear or bent shafts will cause the lengths of the cam angles to vary. Double-breaker lever distributors are not properly synchronized if the breaks or openings between the flame flashes are uneven in length.

To check the distributor for wear or bent shafts, place both the red and blue light-test leads on one set of contact points. If the

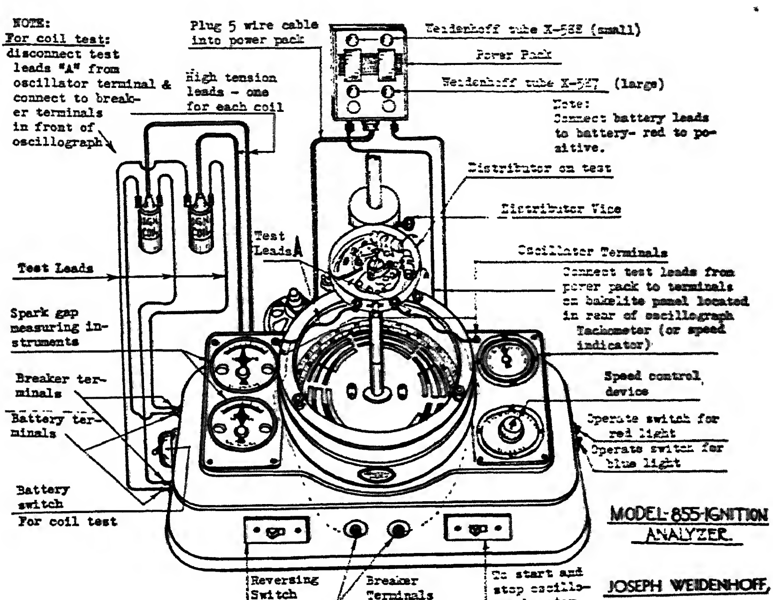


Fig. 38. Equipment for Oscillograph Distributor Test

distributor is in perfect condition the blue and red flashes of light will all be exactly the same length. A maximum of two and one-half degrees difference in the length of the red and blue lights at each end is the limit allowed for a distributor considered to be in good working order.

Note. A difference in length of $2\frac{1}{2}$ degrees at each end of the lights means a total of 5 degrees on the distributor. That is, the cam angle for one cylinder may be 32 degrees while the cam angle for the cylinder firing 180 degrees later on the distributor may be

37 degrees. The distributor would still be considered to be in working order. New distributors are held within limits of 1 degree difference at each end or 2 degrees total difference in cam angles when shipped from the factory.

It will also be noted in the case of a worn distributor shaft that the oscillographic test, sometimes shows up better at high speeds than at low speeds. This is due to the fact that at high speeds the shaft tends to center itself and any irregularity in the opening and closing of the contact breaker points is distributed more or less equally at both sets. The manner in which distributor wear affects cam angle can be shown by the operator by simply forcing the distributor shaft at the top over to the one side or the other and observe the results in the scale cup below. Weak breaker springs allow the points to bounce at high speed. This can be easily detected by the small breaks in the flashes. These small breaks actually amount to opening the breaker points before the proper time and thus prevent the coil from building up its voltage over the required cam angle necessary for that purpose.

Testing a Distributor in Conjunction with a Coil. If there are any poorly riveted contact points in a distributor or any other high-resistance connections, the cam angle can still be set perfectly with the oscillograph unit and if the distributor has double breakers, they can be synchronized properly but the distributor will not pass sufficient current to the coil or coils as the case may be. Because of this, an entirely new test for distributors has been incorporated in the analyzer. To make this test, reconnect the condenser leads in the distributor and disconnect the test leads from the oscillator terminals marked "A," Fig. 38. Connect the test leads to the breaker terminals located in the front of the oscillograph and insert the high-tension leads into the center of the two laboratory-test coils furnished. Connect the two test leads from the breaker terminals on the oscillograph to the primary terminals of each coil. Then connect the test leads from the battery terminals to the primary terminal of each coil.

Note. If the distributor is of the single-breaker type, then only one coil and only one set of terminals will be used.

The operator will know the cam angle of the distributor before making this test so that he can use the chart located on the left side of the panel to determine what speed the distributor should be

turned to make the three standard-coils test corresponding to low, medium, and high engine speeds. If the distributor is in good condition and is turned at the speeds specified by the chart for the particular cam angle of the distributor on test, then the laboratory coils will cause a spark to jump 8 mm., 6.5 mm., and 5 mm. at the low, medium, and high-speed tests respectively. If the coils fail to strike the specified distance, be sure that the battery is fully charged before checking the connections and points in the distributor.

Checking the Coils on the Car. After the distributor has been thoroughly checked and placed in good condition so that the laboratory coils strike the specified gap, the coils on the car can be substituted for the laboratory test coils. Factory specifications for the coils should be ascertained from the Weidenhoff coil-testing data furnished with each ignition analyzer. Revolving the distributor at the same speeds as before, the striking distances of the coil should be checked according to these coil specifications. If the coils fail to strike the specified distance it is important that they be replaced.

Synchronizing Breaker Points on Double-Breaker Lever Distributor. The distributor head should be driven and while rotating the position of the light noted on the oscillograph scale. Rotate the distributor cup so that the light breaks or goes out at the zero position on the scale. For example, in the chart, Fig. 37, showing the cam angle for a straight eight-cylinder engine, note that the zero point has been placed (by shifting the distributor cup) exactly at the place where *A* opens, firing that cylinder. Since the next cylinder in this engine is shown on the chart to fire 45 degrees after the previous cylinder, the plate holding the movable contact arm *B* can be loosened and shifted to a position where light goes out at specified point.

In the case of twin ignition distributors where two sparks occur simultaneously in one cylinder, the end of the red and blue lights should be at exactly the same points. Thus the operator can instantly detect any differences in cam angle. Two degrees difference at the firing point is the limit for twin ignition distributors. In some types of distributors it is necessary to move the entire breaker plate to adjust the breaker arm. In this case moving the plate changes the contact openings and it will be necessary to re-adjust the contact points and re-check on the oscillograph until both points open at the proper position on the rotary oscillograph scale.

Details of

New Equipment

on

1938 Cars

CYLINDERS

(See Vol. I, bottom folios 109 to 138)

CHRYSLER CYLINDER HEAD

In Fig. 1 is shown the cylinder head of a Chrysler engine. Attention is called to the correct order in which the cylinder head bolts should be tightened.

In Fig. 2 is shown a special wrench that is used to tighten down the cylinder heads or nuts. With this wrench each bolt can be

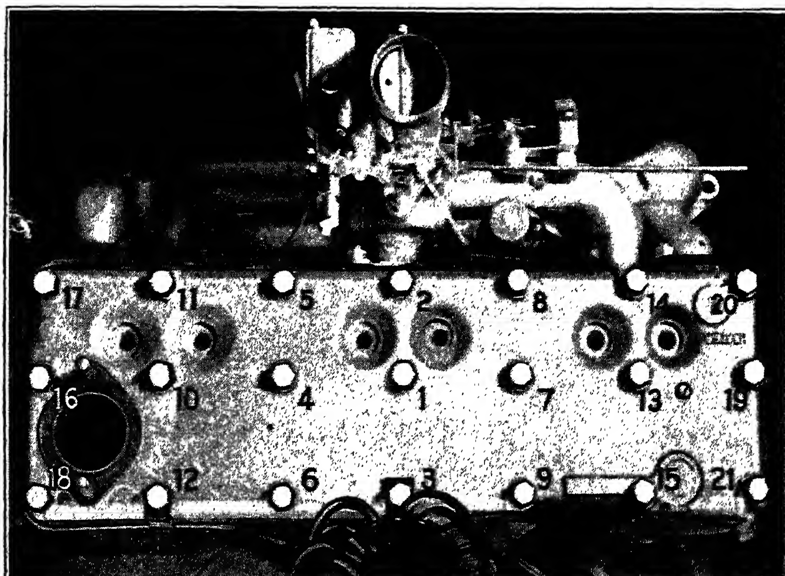


Fig. 1. Chrysler Cylinder Showing Order in which Cylinder Head Bolts or Stud Nuts Should Be Tightened
Courtesy of Chrysler Corporation

tightened to the same tension insuring evenly compressed cylinder head gaskets, thus preventing blown gaskets and also making it easier to get compression tight joints. The wrench prevents overstressing the bolts or studs. Overstressing often causes bolts or studs to stretch and weaken, and it also causes stripped threads or broken bolts and studs in the cylinder block.

On the dial of this wrench are markings, and a pointer moving over the dial and markings shows exactly how many pounds pressure is being put on the studs, nuts, or bolts.

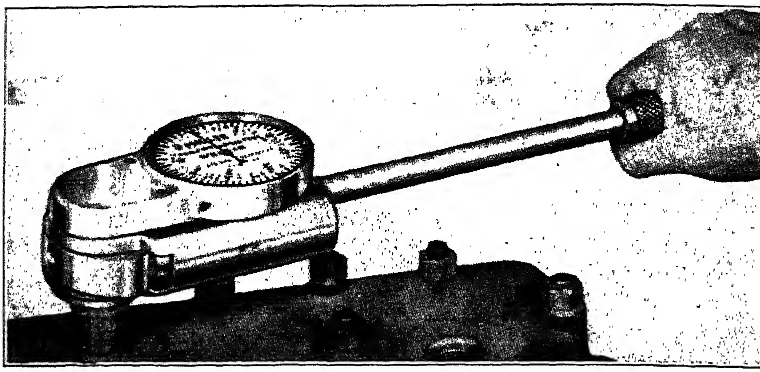


Fig. 2 Special Wrench for Tightening Cylinder Heads or Nuts
Courtesy of Miller Tool Manufacturing Co., Detroit, Michigan

PISTONS AND PISTON PINS

(See Vol. I, bottom folios 139 to 185)

BUICK PISTONS

The pistons used in the 1938 Buick cars have a special dome shaped head, as shown in Fig. 1.

With this construction, in combination with a cylinder head of the same shape, higher compression ratios are possible. This gives a

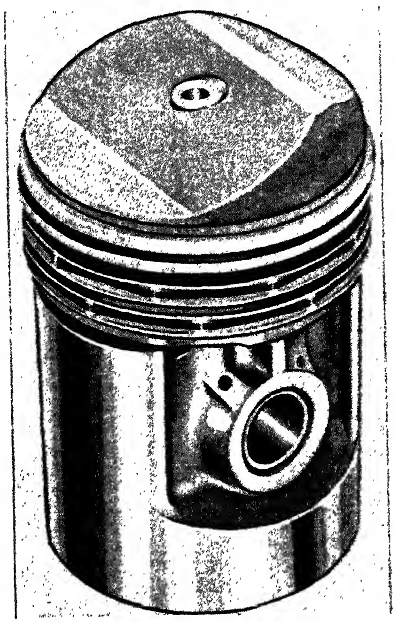


Fig. 1. Buick 1938 Piston
Courtesy of Buick Motor Co.

better control of the combustion, and spark knock is less than that found with flat head pistons using the same compression ratio.

The dome-shaped piston and cylinder head gives greater turbulence to the gases, which is a great factor in efficient combustion and fuel economy.

The pistons are made of light weight alloys heat treated and given the electrolytic treatment, which is known as the anodic treat-

ment. This oxidizes the surface of the piston, which makes it very hard and yet slightly porous, giving greater wearing quality. Oil also adheres to the surface, so that an oil film is maintained under extreme operating conditions as when starting a cold engine, or when the engine runs at a sustained high speed in high air temperatures.

A horizontal slot between the ring lands and skirt on the camshaft side and a T-slot on the left-hand side, combined with cam

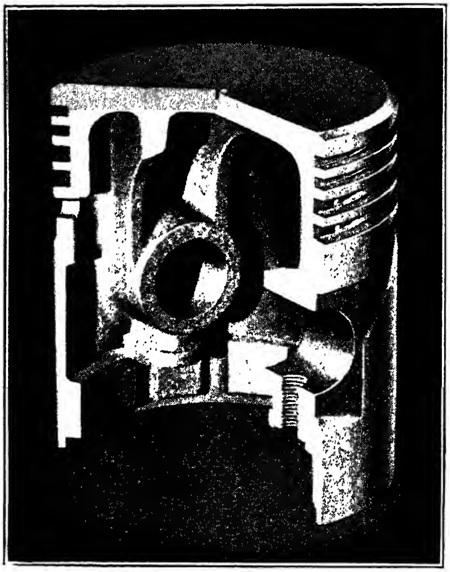


Fig. 2. Oldsmobile Piston Showing Thick Skirt and Balancing Ribs
Courtesy of Oldsmobile Motor Co.

grinding, allow the pistons to be fitted to the cylinder blocks at normal room temperature of about 70° F. This is about the same clearance which would be given to cast-iron pistons. The piston pin is locked in the eye of the connecting rod and floats in the piston. Piston pins are fitted with a light finger push fit which is about .0003″ to .0004″ at about 70° F. Pistons are selected fitted with clearances of .0015″ to .0021″ on the 40 series and .0017″ to .0023″ on the 60–80–90 series.

Clearance of course must be tested always at the point of the greatest piston diameter.

OLDSMOBILE PISTONS

The pistons on both the 6- and 8-cylinder models are electro-hardened aluminum alloy. The pistons have two compression and two oil rings, and balancing ribs on the inside bottom of the skirt as shown in Fig. 2.

Attention is called to the heavy rib at the bottom of the skirt, and the thickness of the skirt, and the double top rib. This heavy construction minimizes distortion to an extremely small amount.

Fig. 3. Oldsmobile Piston Showing Compression and Oil Control Rings, Horizontal and T-slots
Courtesy of Oldsmobile Motor Co.

To prevent scoring, the piston is relieved at each end of the piston pin. To obtain perfect balance, metal has been added to the piston boss opposite the locking screw. Although the piston skirt is heavily constructed, it is flexible owing to the horizontal slot provided on the maximum thrust side or valve side of the piston, and the two slots as provided on the minimum thrust side shown in Fig. 3. These partly isolate the head with its thicker section from the skirt, with its relatively thin section and oval contour. These slots are backed

with reinforcing ribs and prevent collapse and assure adequate strength.

To insure adequate cylinder wall lubrication at lower speed and during the warm-up period, when there is insufficient throw off from the bearing, an oil spit hole is drilled in the upper half of the connecting rod bearing. When the shaft revolves in the bearing, this oil spit hole lines up with the oil hole in the crankshaft as the piston approaches top dead center of each piston stroke and a spray of oil is shot onto the exposed cylinder wall.

VALVE-OPERATING MECHANISMS

(See Vol. I, bottom folios 229 to 269)

LINCOLN HYDRAULIC VALVE LIFTER ASSEMBLY

To insure quietness of operation, the clearance between the valve lifters and valves is maintained automatically at a zero point in the Lincoln hydraulic valve lifters, Fig. 1.

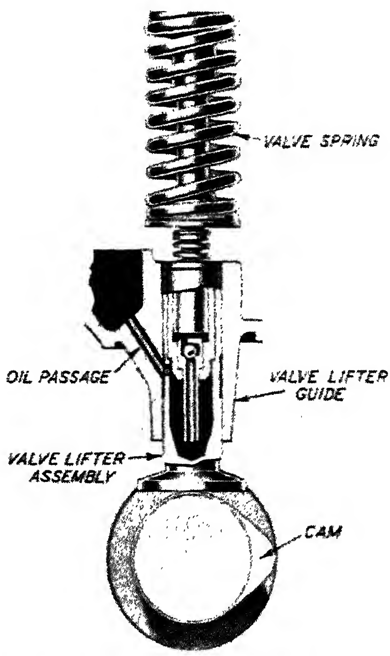


Fig. 1. Lincoln Hydraulic Valve Lifter Assembly
Courtesy of Ford Motor Co.

Valve lifters are self-adjusting to compensate for the expansion and contraction of the valve stems. Oil under pressure is supplied into the valve lifter assembly from the main oil manifold.

During the short interval that the valve is off its seat, there is

slight oil leakage which occurs in the valve lifter. This is necessary to compensate for any expansion of the valve stem, which naturally occurs when the valve stem becomes heated because of engine operation.

The leakage of oil is replenished when the valve closes, and this eliminates clearance between the lifter and valve stem. Valve opera-

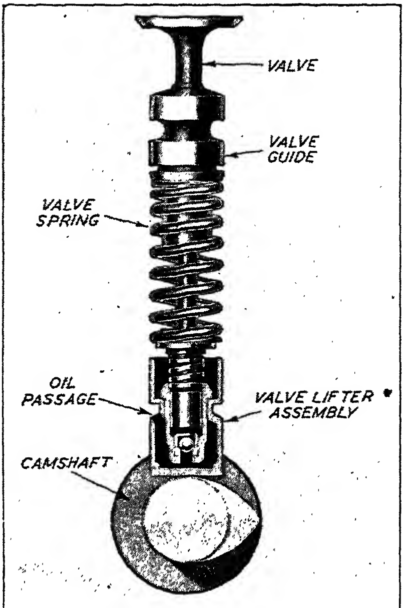


Fig. 2. Lincoln-Zephyr Hydraulic Valve Lifter Assembly
Courtesy of Ford Motor Co.

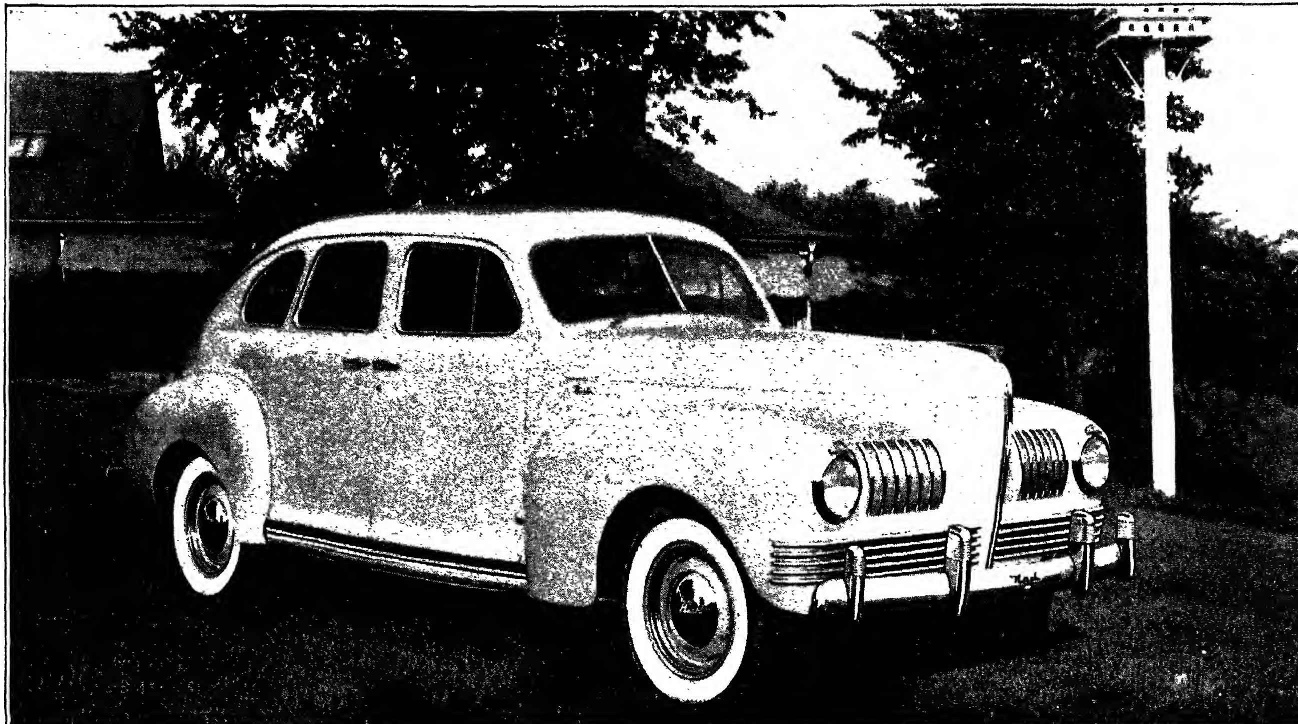
tion is quiet, and is constantly maintained in the manner described. No noise occurs because the valve lifter assembly is always in contact with the bottom of the valve stem.

There is no necessity to ever check valve clearances in the Lincoln engine.

LINCOLN-ZEPHYR VALVE LIFTER ASSEMBLY

The principle of operation of the Lincoln-Zephyr valve lifter assembly, Fig. 2, is similar to that described in respect to the Lincoln engine, Fig. 1.

There is however a slight difference in the construction of the assembly and also in the way that the oil is supplied into the valve lifter assembly. In the Lincoln-Zephyr assembly, the oil is supplied by pressure into the valve lifter assembly from auxiliary oil lines which are fed from the oil manifold. While in the Lincoln, oil under pressure is supplied into the valve lifter assembly direct from the main oil manifold.



NASH 1941 AMBASSADOR EIGHT FOUR-DOOR SEDAN
Courtesy of the Nash-Kelvinator Corporation

CRANKSHAFTS

(See Vol. I, bottom folios 301 to 337)

PONTIAC MAIN BEARINGS

The main bearings on the Pontiac 1938 engine are of the steel back babbitt faced type and the upper and lower halves are interchangeable.

No shims are used, and to insure correct clearance the bearing caps are inserted in the block. Bearings can be easily replaced, with-

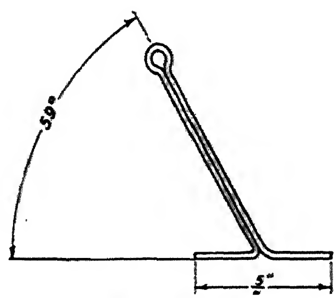
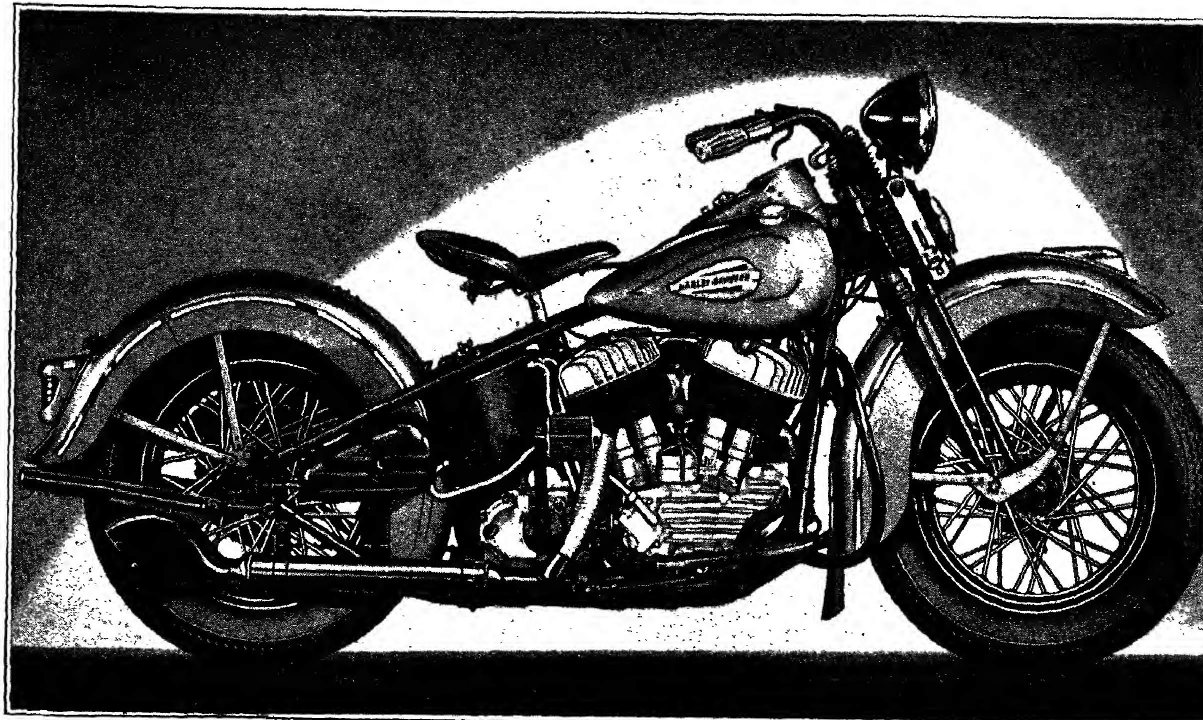


Fig. 1. Cotter Key

out removing the shaft from the engine, in the following way: A ⅛″ by 1½″ cotter key, shaped as shown in Fig. 1, may be placed in the oil hole in the crankshaft, and then by rotating the shaft in the proper direction of rotation the bearing will be removed easily.

To replace the upper half of the bearing, the plain edge of the bearing should be inserted in the indented side of the upper bearing holder, and it can be put into position by gently rotating the shaft and bearing.

Strict instructions are given by the Pontiac Company that bearing caps should never be filed to take up bearing play. Bearing caps are part of the cylinder block assembly and should not be serviced separately.



1940 80-CU. IN. TWIN HARLEY DAVIDSON MOTORCYCLE
Courtesy of the Harley Davidson Motorcycle Company

CARBURETORS

(See Vol. II, bottom folios 11 to 202)

BUICK CARBURETORS

The following material has been supplied by the Buick Motor Car Company.

MARVEL CARBURETOR

General Description. The Model "CD-1B" "Marvel" carburetor used on Series 40 and the Model "CD-2B" "Marvel" carburetor used on Series 60–80–90 are of the plain tube, fixed jet type, and have the following features:

1. A mixture adjustment for idle on each barrel of the carburetor.
2. A vacuum controlled step-up, or "Economizer," which insures, automatically, maximum economy for normal operating conditions and full power mixture for acceleration, hill climbing, and high-speed operation.
3. Direct action accelerating pump with pump stroke adjustable for seasonal requirements.

Construction. The carburetor is made up of two major units—a cast-iron double throttle body, fuel bowl and double mixing chamber combined, and a die cast zinc bowl cover and air inlet assembly combined.

The fuel bowl is provided with an atmospheric air vent in the cover and two special additional vents to improve hot engine operation.

Special features are embodied in the nozzle and fuel passage construction to prevent "percolation" of fuel from carburetor nozzles after a hard run in hot weather.

Operation. The carburetor is provided with two floats, two complete idle systems, two main nozzle systems, two metering pin and jet systems, two accelerating pump discharge jets, two mixing chambers and two throttle valves. In the schematic view, Fig. 1, only one of each duplicated system is shown, and the description to follow will deal with these duplicate units as a single system.

Idle System. With the throttle valve slightly open to permit idling, the vacuum below the throttle on the manifold side is high. Very little air passes through the venturi at this time, and with very low suction on the main nozzle it does not discharge fuel. This high suction beyond the throttle, causes the idle system to function, as the primary idle delivery delivers into the high suction zone beyond the throttle.

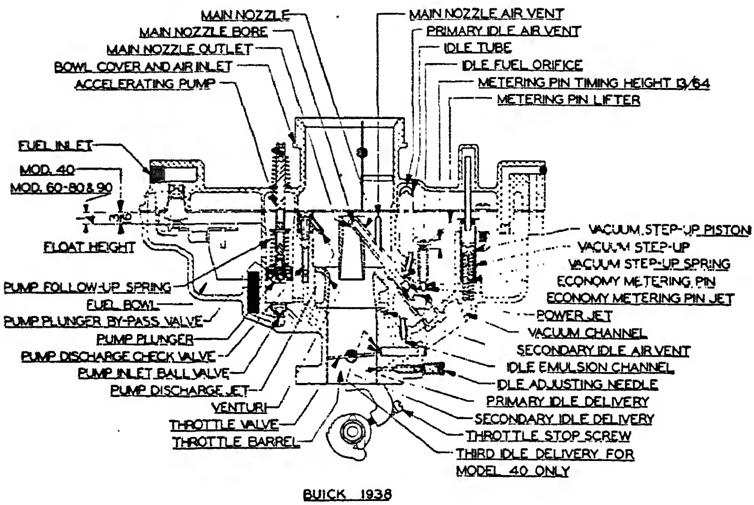


Fig. 1. Buick 1938 Marvel Carburetor
Courtesy of Buick Motor Car Co.

Fuel from the fuel bowl passes through the metering pin and jet, power jet, and into main nozzle bore where it passes through idle fuel orifice in the side of nozzle bore into idle fuel channel, thence through the idle tube where it is mixed with air which is allowed to enter the idle tube through the primary air vent.

The resultant emulsion of fuel and air passes downward through the idle tube to the idle emulsion channel, where an additional amount of air is blended with the emulsion through the secondary idle air vent. This rich emulsion is finally drawn into the throttle barrel through the primary idle delivery opening, subject to the regulation of the idle adjusting needle, where a small amount of air passing the throttle valve mixes with it, forming a combustible mixture for idling the engine.

The idle adjusting needle controls the quantity of rich emulsion supplied to the throttle barrel and, therefore, controls the quality of the "curb idle" mixture. Turning the needle away from its seat enriches the idle mixture to the engine, and turning the needle toward its seat thins the idle mixture.

On "curb idle" some air is drawn from the throttle barrel above the throttle valve through the secondary idle delivery opening and blends with the idling mixture being delivered to the engine, subject to regulation of the idle adjusting needle.

The secondary idle delivery begins to deliver idling mixture to the engine as the throttle is opened, coming into play progressively and blending with the primary idle delivery to prevent the mixture from becoming too lean as the throttle is opened and before the main nozzle starts to feed.

On the Series 40 carburetor a third idle delivery is used to allow smoother progression in the fuel delivery from the idle system to the main nozzle, and is not required in the Series 60 carburetor, because the larger engine pulls more air through the carburetor at the lower speeds causing the main nozzle to deliver sooner.

Metering. All fuel delivery on idle and also at steady car speeds, up to approximately 18 miles per hour, is from the idle system. At approximately 18 miles per hour, the suction from the increasing amount of air now passing through the venturi causes the main nozzle to start delivering, and the idle system delivery diminishes due to lowered suction on the idle delivery openings as the throttle valve is opened for increasing car speeds. The idle delivery is practically nil, until at approximately 40 miles per hour and most of the fuel delivery from that point on to the highest speed is from the main nozzle. However, the fuel feed at any full throttle speed is entirely from the nozzle.

The idle system and the main nozzle are connected with each other by the idle fuel channel. The amount of fuel delivered from either the idle system or main nozzle is dependent on whether the suction is greater on the idle system or main nozzle, the suction being governed by throttle valve position and engine load.

The main nozzle feeds at any speed if the throttle is open sufficient to place the engine under load, which drops the manifold suction. Under such conditions of low manifold suction at the throttle

valve, the main nozzle feeds in preference to the idle system because suction is multiplied on main nozzle by restriction of the venturi.

Main Nozzle. The main nozzle is supplied with fuel which passes from the fuel bowl through the economy metering pin jet. The fuel then passes upward through the nozzle bore where it is mixed with air drawn from the nozzle air vent and is then discharged from the nozzle outlet as an air and fuel emulsion into the mixing chamber. Air passing through the nozzle air vent sweeps fuel from the nozzle bore under very low suction and, therefore, satisfies any sudden demand for nozzle fuel delivery. It also causes the nozzle to feed sufficient fuel at very low speeds with the engine under load.

Vacuum Step-Up (Suction Control Metering Pin "Economizer"). The vacuum step-up works instantaneously with any change in manifold vacuum caused by sudden change in engine load, and is not dependent entirely upon throttle position. It is possible to impose a heavy load upon the engine, particularly at low speeds, in accelerating or climbing a grade, with the throttle only slightly opened, and under these conditions the vacuum step-up operates, giving a full power mixture which eliminates missing, "lean feeling" and "spots," which might otherwise occur if the engine were operated under heavy load with a lean mixture.

In part throttle acceleration on a level road, the mixture is "stepped up" to a power mixture only temporarily, because as the engine speed increases with the throttle in one position the manifold vacuum increases, and immediately pulls the metering pin back into the jet. Likewise, during the warm-up period after starting cold, the vacuum step-up operates automatically and instantaneously when the engine falters and thus reduces the amount of choking necessary to smooth operation.

Fig. 1 shows the vacuum step-up and the vacuum channel transmitting the vacuum below the throttle to the vacuum step-up piston. The vacuum step-up piston, to which is attached the metering pin lifter, is drawn downward by high suction below the throttle valve, against the pressure of the vacuum step-up spring and thus lowers the metering pin into the economy metering pin jet thus providing a lean mixture for part throttle economy. When the suction below the throttle is low, the metering pin is raised from the economy metering pin jet.

The power jet then meters a richer full power mixture for full throttle or heavy load. The vacuum step-up spring is calibrated to allow the metering pin to remain in the jets for maximum economy up to a car speed of approximately 75 miles per hour on a level road.

Accelerating Pump. The accelerating pump discharges fuel only when the throttle is moved toward the open position, and provides additional fuel to keep in step with the sudden inrush of air into the manifold when the throttle is opened.

Through a walking beam and a system of levers, the accelerating pump plunger is moved downward when the throttle is opened, thus forcing fuel past the pump discharge check valve, through the pump discharge jet into the mixing chamber. On closing the throttle, the accelerating pump plunger moves upward, thus refilling the pump chamber by drawing fuel from the fuel bowl through the pump inlet screen and pump inlet ball valve.

On any quick opening of the throttle, the pump follow-up spring yields and permits the pump plunger to prolong the pump discharge. Also, built into the pump plunger is a pump plunger by-pass valve, which on rapid movement of the throttle permits a portion of the accelerating charge to by-pass the plunger back to the fuel bowl, thereby aiding the pump follow-up spring in preventing "slugging" of a warm engine with fuel.

The valve spring above the plunger by-pass valve is strong enough to hold the valve on its seat for normal operation of the throttle, preventing loss of accelerating charge to the engine, except when the throttle is opened quickly, as above described.

Adjustment. If, after checking all other points on the engine, it is found necessary to readjust carburetor, proceed as follows: With the engine thoroughly warmed up, set throttle stop screw which bears against cold idle control cam mounted on intake manifold so that the engine idles at a speed equivalent to 7 to 8 miles per hour on a level road.

There is one idle adjusting needle for each barrel of the carburetor. Adjust each barrel separately. Turn the idle adjusting needle out slowly until the engine "rolls" from richness, then turn the needle in slowly until the engine "lags" or runs irregularly from leanness. This step will give an idea of the idle adjustment range and of how the engine operates under these extreme idle mixtures.

From the lean setting turn the needle out slowly to the richest mixture possible that will not cause the engine to "roll" or run unevenly. Repeat this procedure on the other barrel. This adjustment will in most cases give a slower idle speed than a slightly leaner adjustment, with the same throttle stop screw setting, but it will give also the smoothest road operation.

A change in idle mixture will change the idle speed and it may be necessary to readjust the idle speed with the throttle stop screw to the desired point. The idle adjusting needles should be from ¾ to 1 turn from their seats to give a satisfactory idle mixture.

Caution. Do not turn needles tightly against seats, as grooves will be cut into the needles by the seats and will make a satisfactory adjustment difficult to obtain.

LINCOLN CARBURETOR

The Stromberg type Double E carburetor, as used on the Lincoln car, is of the plain tube dual down-draft type, with all orifices being fixed. The mixture used throughout the operating range is determined by the size of the main metering jet, Fig. 2. The mixtures for idling and closed throttle operation are controlled by the idling adjusting screws as shown in Fig. 2. These screws operate on a predetermined mixture of gasoline and air, and turning them clockwise provides a leaner mixture.

As the carburetor supplies mixture to the two cylinder blocks individually, either one of the adjusting screws should be turned in or out, as found necessary, until the fastest and steadiest running position from that throttle is obtained. These screws adjust the mixture that is fed by either the right or left carburetor barrel. The right barrel feeds the right block and the left barrel feeds the left block.

Adjust either idling adjusting screw so that six cylinders fire smoothly. Cutting out one block of cylinders by shorting the low tension distributor wire is a good method to use when making the idle adjustment.

The throttle stop screw should be adjusted to give the minimum idling speed. If the engine idles too fast or too slow, after completing the idling adjustment, the throttle stop screw should be adjusted, by turning the screw clockwise to increase the engine speed, and turning the throttle stop screw anti-clockwise so it will reduce the speed.

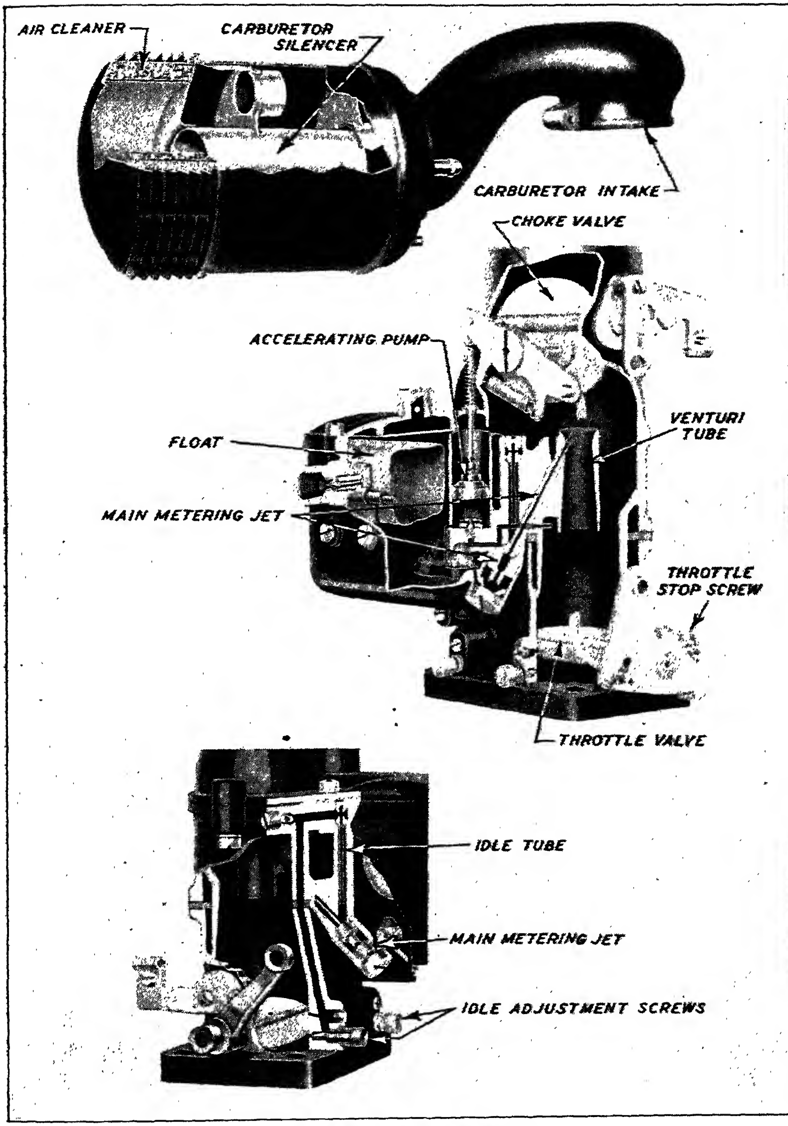


Fig. 2. Lincoln Carburetor
Courtesy of Ford Motor Co.

Before any carburetor adjustments are made, the engine should be run long enough so that the water in the radiator is heated sufficiently to cause the radiator shutters to open fully.

To determine if fuel is being supplied to the carburetor, remove either of the float chamber plugs to check for fuel at that point.

The carburetor adjustment should never be changed until all other possible sources of trouble have been investigated. Spark plug points and distributor breaker points should be properly adjusted and cleaned.

Compressions should be good and equal in all cylinders.

Intake manifolds and carburetor base and connections should be checked for air leaks.

The accelerating pump shown in Fig. 2 can be adjusted for winter and summer operation and should be changed accordingly.

A greater discharge from the accelerating pump is desirable in the winter, and this can be obtained by assembling the accelerating pump rod in the hole farthest from the center of the throttle stem. Assembling the pump rod in the hole nearest the center of the throttle stem will cut down the discharge from the accelerating pump. This makes it also desirable for summer adjustment.

For normal running the carburetor choke control button on the instrument panel should be pushed all the way in, and should be in that position to make continuous use of the engine. It also must be in while making carburetor adjustments.

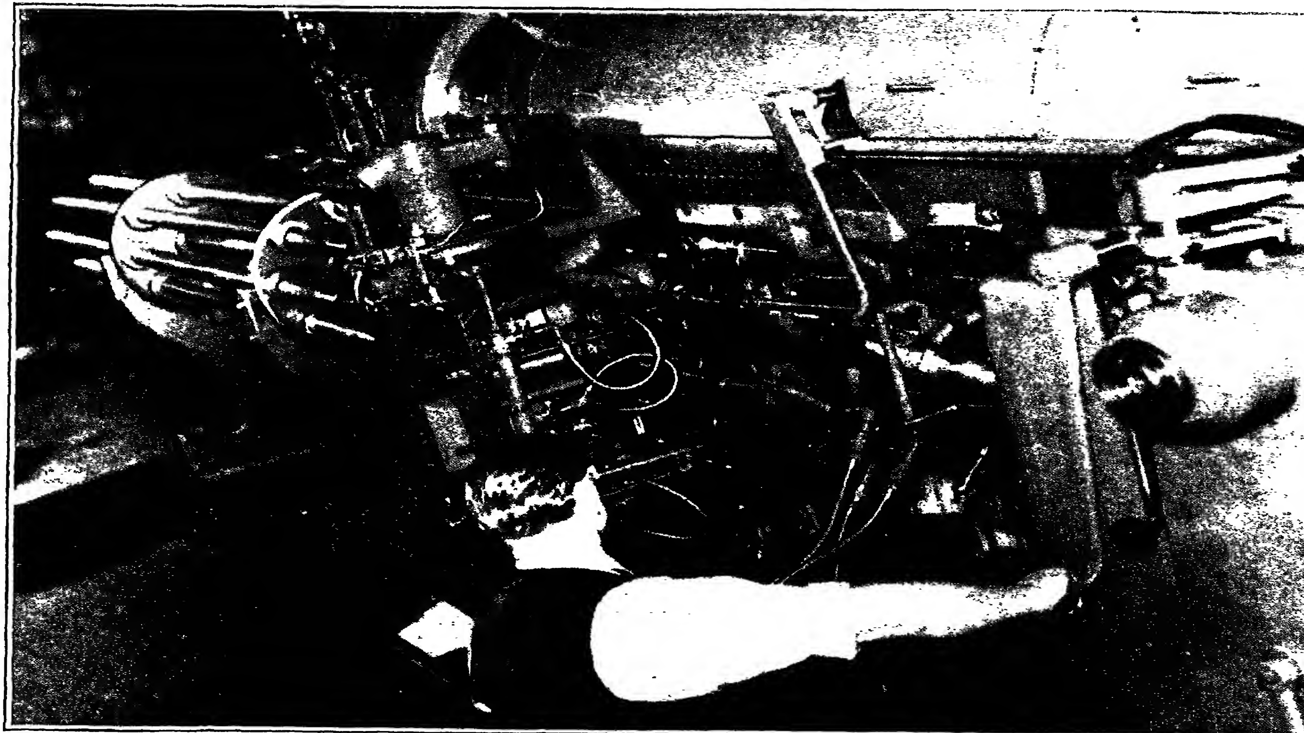
A valve in the air intake of the carburetor is operated by the choke button. When the choke is used the amount of air admitted to the carburetor is decreased, causing a richer mixture to be formed, which is necessary for starting purposes. The choke should be used for starting and warming up the engine only, and then as little as possible.

If the choke is used when starting a warm engine, the mixture may become too rich preventing the charge being ignited readily, in which case the engine should be cranked with the throttle all the way out, and without using the choke.

The carburetor silencer and air cleaner are attached to the carburetor air intake. The air cleaner is located at the forward end of the unit, and it not only cleans the air going into the carburetor, but it also reduces carburetor noise.

To be sure that the engine obtains the correct amount of air at all times, the cleaner should be cleaned out periodically. The length of time between cleaning depends upon the conditions of the roads upon which the car is operated.

The air cleaner can be cleaned by removing it and washing it in gasoline, after which the unit should be thoroughly dried and then submerged in a good grade of engine oil and allowed to drip dry before installing.



AUTOMATIC LATHE FOR MANUFACTURING 1941 HUDSON TRANSMISSIONS
Courtesy of the Hudson Motor Car Company

CLUTCHES

(See Vol. II, bottom folios 259 to 308)

1938 CHEVROLET CLUTCH

A distinct departure from the standard clutch, with its coil springs, is found in the clutch developed for the 1938 Chevrolet, in

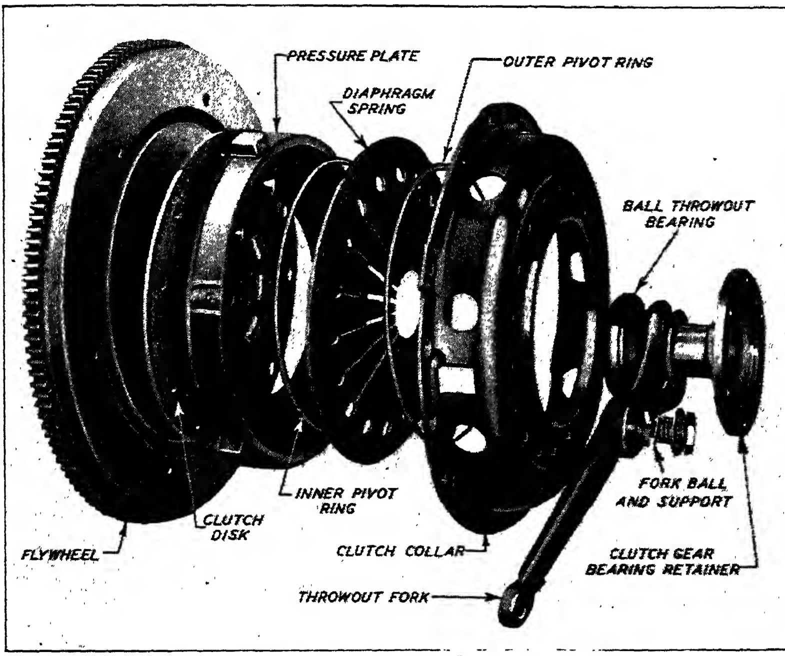


Fig. 1. 1938 Chevrolet Clutch Showing Parts Assembled
Courtesy of Chevrolet Motor Co.

which all coil pressure springs are replaced by a diaphragm disk spring as shown in Fig. 1.

The clutch is of the single plate dry disk type, and the advantages claimed for this new clutch are of a lighter pedal pressure which decreases as the clutch is disengaged, smoother and more positive operation resulting from softer engagement, quicker repair and adjustment because of simpler design, lighter and more durable construction, which gives smoother engine operation at high speed.

The diaphragm spring is made of a very high quality steel carefully heat treated and shot blasted to assure long life.

The action of this spring is comparable to the flexing action of the bottom of an ordinary oil can. When the clutch pedal is de-

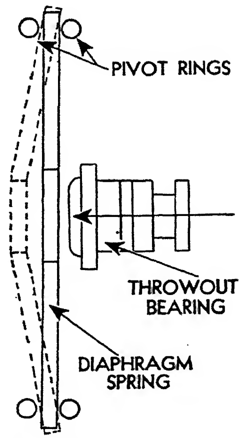


Fig. 2. Chevrolet Clutch Pedal Depressed
Courtesy of Chevrolet Motor Co.

pressed, the throwout bearing is forced against the diaphragm spring fingers, and this causes the diaphragm spring to pivot on the pivot rings shown in Fig. 2.

When the clutch is engaged, the fingers are flat and the entire rim on the diaphragm spring exerts pressure against the pressure plate, Fig. 3.

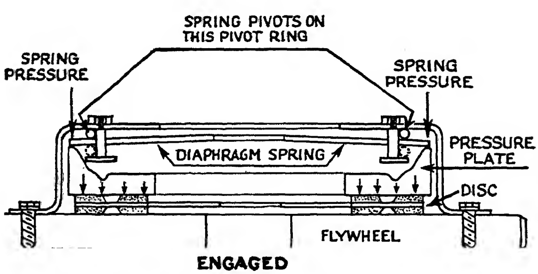


Fig. 3. Chevrolet Clutch Engaged
Courtesy of Chevrolet Motor Co.

The action of the clutch pedal when depressed causes pressure on the throwout bearing which in turn causes pressure on the inner

ends of the fingers, causing a diaphragm action, and the outer ends of the fingers near the rim pivot on the inner pivot ring, Fig. 4. This action causes the rim of the spring and the pressure plate to move away from the clutch disk, thus disengaging the clutch. As the clutch pedal is released, the pressure on the throwout bearing is also

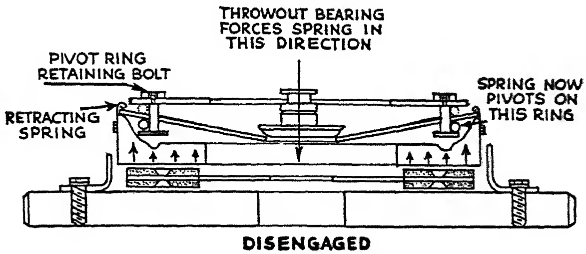


Fig. 4. Chevrolet Clutch Disengaged
Courtesy of Chevrolet Motor Co.

released and no longer makes contact with the fingers. The spring in this material causes the fingers to pivot about the near pivot rings and the rim to bear against the pressure plate.

The reduced pedal pressure of this new diaphragm spring clutch tends toward more comfortable driving. There is a distinct ease of pedal feel not found in the ordinary clutch, for as the clutch is disengaged, the required pedal pressure decreases during the pedal stroke. The adverse is true in respect to other clutches wherein the pedal pressure increases during this part of the stroke.

CHRYSLER CLUTCH COVER ASSEMBLY

When clutch repairs are made on the Chrysler, De Soto, Dodge, and Plymouth cars, accurate adjustment of the clutch release levers is necessary for proper clutch operation. After the parts of the clutch are assembled, the cover should be put into position. The assembly may then be slowly compressed as shown in Fig. 5, making sure that the eye bolts and pressure plate lugs are located in the proper holes in the cover. While compressing be sure that the clutch pressure springs remain on their seats.

The adjusting nut should be screwed down on the eye bolt, while the clutch is held under compression until the release levers

are adjusted properly. A special fixture, as shown in Fig. 5, is used and is as follows:

A U shaped spacer of the proper thickness is placed under the extension gauge as shown at 5 in the illustration: for the Chrysler C-18, $\frac{1}{16}''$; for the C-19, $\frac{3}{16}''$; for the C-20, $\frac{1}{8}''$; for the De Soto, S-5, $\frac{1}{16}''$; for the Plymouth, P-5, P-6 passenger cars, $\frac{3}{16}''$ and Dodge D-8 passenger cars $\frac{1}{16}''$ spacers should be used.

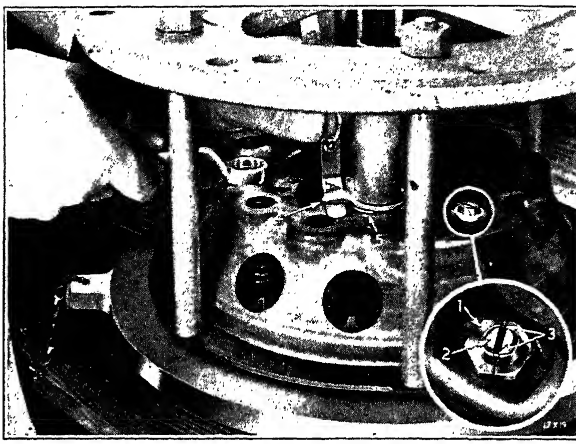


Fig. 5. Dodge, Chrysler, De Soto, and Plymouth Clutch Showing Release Lever Adjusting Fixture

1. Eye Bolt Nut; 2. Eye Bolt; 3. Strike Here to Lock; 4. Adjusting Finger (part of adjusting tool); 5. Spacer (part of adjusting tool)

Courtesy of Chrysler Corporation

Tighten the knurled sleeve with the extension gauge arm directly above the clutch release lever. Turn the adjusting nut on the release lever eye bolt, until the feeler gauge *A* will just slide with a slight drag between the release lever and the extension gauge. All release levers must be adjusted in the same manner; and they must all be adjusted to exactly the same height above the machined surface of the pressure plate, to keep the pressure plate and flywheel parallel to each other.

The adjustment can only be made accurately by using the correct clutch compressing and adjusting fixture shown.

SELECTIVE TRANSMISSION

(See Vol. II, bottom folios 335 to 412)

PONTIAC TRANSMISSION

Synchronizing Drums (1938). The 1938 synchronizing drum assemblies, Fig. 1, are the same size on the higher gear end as on the

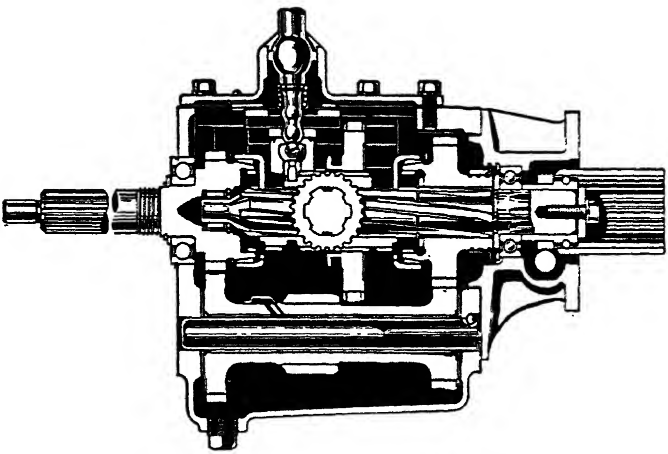


Fig. 1. Pontiac 1938 Transmission
Courtesy of Pontiac Motor Co.

second gear end and are interchangeable. No anti-rattle spring is used in the second gear drum as used on past models.

Each drum assembly, Fig. 2, has two cams instead of three and likewise only two detent springs are used in place of three. The drums are retained on the clutch gear and second speed gear by spring wire retainers as shown in Fig. 3.

Counter Gear Shaft (1938). The counter gear shaft is prevented from turning or moving forward by a ball lock at the rear end of the shaft. The ball lock, as shown in Fig. 4, is retained by a depression in the shaft and a slot in the case.

Rear Bearing Retainer (1938). The front face of the 1938 rear bearing retainer extends downward far enough to act as a retainer for the counter gear shaft and the ball lock.

Shifter Forks (1938). The bearing area of both shifter forks has been reduced on the 1938 transmission to reduce possibility of

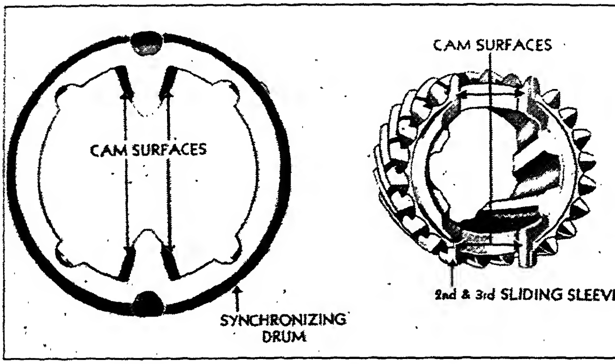


Fig. 2. Synchronizing Drum
Courtesy of Pontiac Motor Co.

noise. Before removing a transmission for noise, make sure that the felt is in place between the transmission and floor covering; that the rubber boot is down tight around the transmission tower; and that

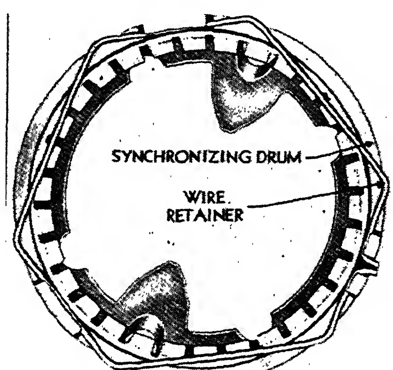


Fig. 3. Synchronizing Drum and Gear Retaining Wires
Courtesy of Pontiac Motor Co.

the floor mat is sealed around the lever properly. If the oil level is too high or too low it may result in noise.

PONTIAC SAFETY=SHIFT GEAR CONTROL

To give the front seat passengers more space and leg room in the Pontiac car, an optional gear shift mechanism has been designed by the Pontiac engineers. This consists of a gear shift lever below the steering wheel which swings about the shift shaft held parallel with the steering column, Fig. 5. The following description of the optional gear shift has been courteously supplied by the Pontiac Company.

Safety=Shift Gear Control. An optional gear shift is supplied at slight extra cost on the 1938 models. It consists of a gear shift lever

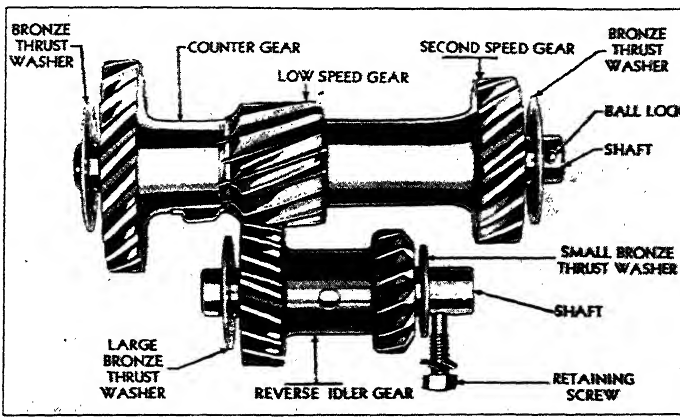


Fig. 4. Counter Gear Shaft
Courtesy of Pontiac Motor Co.

below the steering wheel which swings about the shift shaft held parallel with the steering column as shown in Fig. 5.

The shift positions are the same as though the standard gear shift lever had been bent over to the right or the whole transmission turned over on its right side, bringing the familiar "H" up from its old position on the floor to a position on its edge under the right-hand side of the steering wheel. In this position the shifting is exactly the same as the standard type, except that the crosswise movement through neutral is an up and down motion. Fore and aft positions for reverse and first, second, and high remain unchanged. The clutch pedal is used in the same manner as with the conventional gear shift. The optional assembly consists of two linkages: 1. The selector linkage; and 2. The shifting linkage.

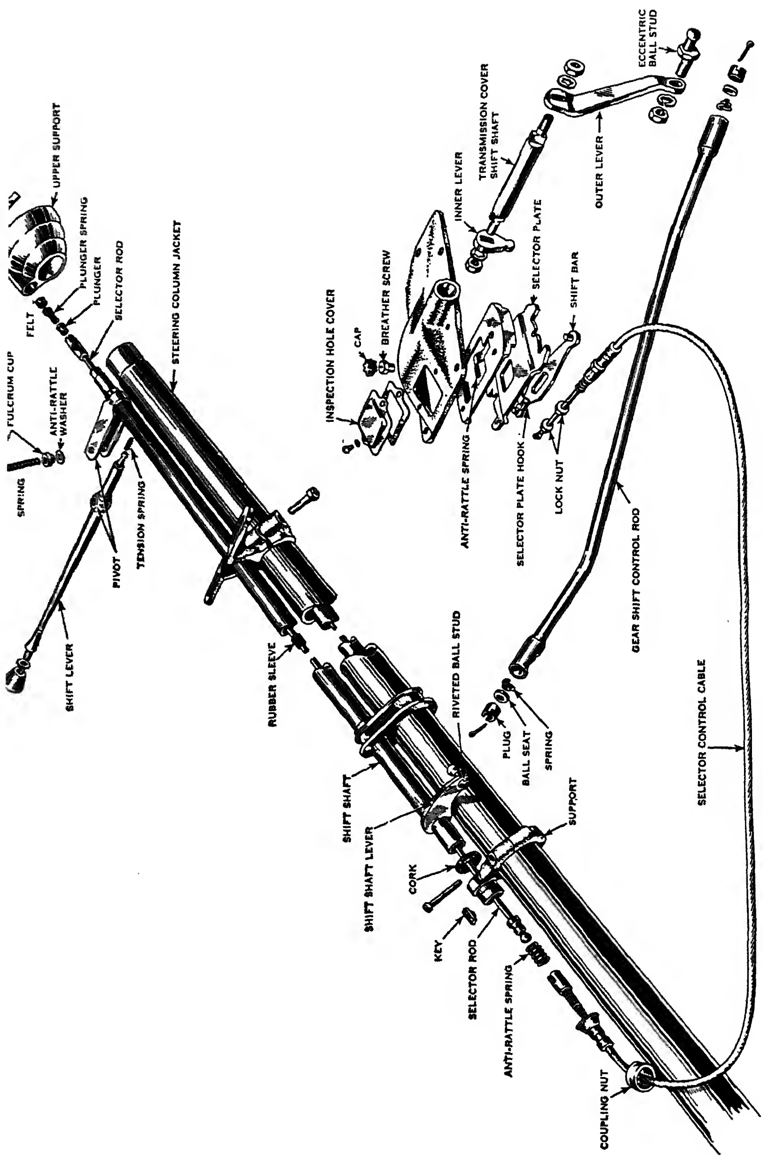


Fig. 5. Details of Pontiac Optional Gear Shift Control
Courtesy of Pontiac Motor Co.

Selector Linkage. The gear shift lever is pivoted in the housing at a point approximately ¾ of its length from the outer end. The inner end of the gear shift lever, shown in Fig. 5, terminates in a ball joint. Motion of the gear shift lever parallel to or in line with the steering column moves the selector control rod up or down inside the hollow shift shaft. The lower end of the rod is connected to the selector control cable which runs into the transmission case and is attached to a hook on the selector plate.

Moving the gear shift lever toward the steering wheel rim makes the same selection as moving the standard shift lever to the left. In this position it is possible to engage either reverse or low. Moving the shift lever away from the steering wheel rim makes it possible to engage either second or high.

Engaging Linkage. The housing in which the gear shift lever is pivoted is attached to the hollow shift shaft above the steering column. Movement of the shift lever parallel with the steering wheel rim rotates the shift shaft.

A lever is attached at the lower end of the shift shaft. The ball jointed control rod connects the lever with the outer lever which is attached to the shaft projecting from the transmission cover. A gear shift shaft inner lever is attached to the inner end of the transmission cover shaft and contacts the shift bar or engaging portion of the shift mechanism. Movement of the lever is translated into engaging or disengaging the transmission gears.

The two functions of shift selection and engagement are neatly combined with a minimum of parts for simple, positive shift control with a minimum of friction and lost play.

Adjustments. Two adjustments are provided which determine the position of the shift lever when the transmission is in neutral.

Selector Position Adjustment. The selector control cable is attached to a hook on the selector plate inside the transmission case. Adjustment is made by turning the lock nuts on the end of the cable which attach it to the hook. See Fig. 5.

Adjustment Procedure—

1. Remove the front floor center plate.
2. Remove the inspection hole cover from the transmission cover.

3. Adjust to bring the gear shift lever to the position shown in Fig. 6.
   Caution—Tighten selector control cable lock nuts securely.
   Note—Turning the lock nuts toward the end of the flexible wire cable moves the outer end of the gear shift lever away from the steering wheel. Turning the lock nuts away from the end moves the gear shift lever toward the steering wheel.
4. Reassemble inspection hole cover and floor center plate.

Engagement Position Adjustment. The gear shift lever is approximately horizontal in the neutral position when it is correctly

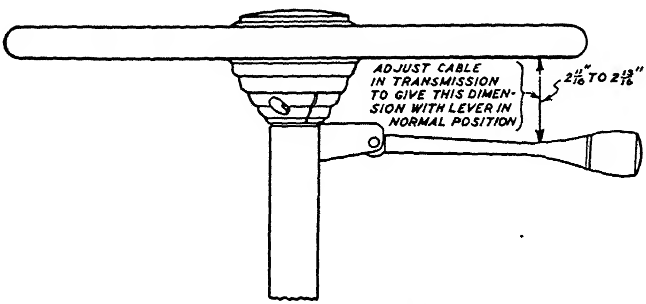


Fig. 6. Gear Shift Lever

adjusted. This position is regulated by turning the eccentric ball stud in the transmission case outer lever, shown in Fig. 5. Loosen the lock nut on the inner end of the ball stud and turn the stud until the shift lever is in a horizontal position. Tighten lock nut securely.

Lubrication

The safety-shift gear control is lubricated at assembly and requires further lubrication only when the parts are disassembled.

When assembling, apply the lubricant to the following parts:

1. Threads, plugs, plunger, and bearings in upper end of the shift shaft.
2. Lower end of rod and bearings in lower end of the shift shaft.
3. Ball joints in ends of gear shift control rod assembly.
4. Shift shaft anti-rattle spring at upper end of shift shaft.
   Caution—Do not apply lubricant to the selector rod rubber sleeve.

Gear Shift Control Rod End Adjustment

Correct adjustment of control rod end plugs is as follows: With all parts in proper place, screw end plugs tightly into the seat assembly and back off plug from 1/8 to 3/8 turn and install cotter pin.

Removal of Gear Shift Lever

1. Compress fulcrum cups using special tool.
2. Pull lever out of its mounting. Take care to save the spacing shims, anti-rattle washer and tension spring.

Maintenance Hints

1. Gear shift lever too close to steering wheel causing interference with hand, or too far away.
   Correction—Adjust selector cable lock nuts in transmission as previously described.
2. Gear shift lever not horizontal in neutral.
   Correction—Adjust eccentric stud on transmission cover outer lever as previously described.
3. Too much lost motion at gear shift lever pivot.
   Correction—Remove the shift lever and add shims as required to remove excessive clearance.
4. Rattle at gearshift lever pivot.
   Correction—See that anti-rattle washer is in place and sufficient shims are used.
5. Buzz at inner end of gear shift lever.
   Correction—See that tension spring and plunger spring are in place. See that plunger seats on gear shift lever ball.
6. Too much gear shift lever travel when shifting.
   Correction—Check tightness of lock nut on outer end of transmission cover shift shaft. Check tightness of eccentric ball stud nut on outer lever and riveted ball stud on shift shaft lever.
7. Selector rod rattles in shift shaft.
   Correction—See if rubber sleeve is in place approximately in middle. If no sleeve is present, wrap the center of the rod with friction tape to a maximum diameter of 3/8".
8. Buzz or rattle at lower end of shift shaft.
   Correction—See that anti-rattle spring is in place between

upper end of selector control cable and lower end of selector rod.

9. Spring pressure too light or too heavy when moving gear shift lever for selecting.
   Correction—Adjust selector control cable lock nuts in transmission case as instructed under the heading "selector position adjustment."
10. Gear shift control rod rattles or clicks when shifting.
   Correction—See that springs and ball seats in rod ends are in place. Adjust end plugs. (See also correction for too much gear shift lever travel when shifting.)
11. Gear shift lever shakes when driving.
   Correction—Adjust end plugs in gearshift control rod. See that shift shaft anti-rattle spring is in place in the upper support. See that transmission cover shift shaft is free in transmission case cover. See that plug at the lower end of the gear shift control rod is not adjusted too tightly.
12. Gear shift lever sticks when moved from low speed to high speed side.
   Correction—Selector plate does not shift easily. See that shift bar end pins do not bind in notches in ends of selector plate. See that neutral notches in the shift rails are longer than gear position notches to permit selector plate to slide freely. Check for warping of selector plate due to improper assembly of cover. Plates may be out of line. Check for kink in selector control cable. Check lock nuts on selector control cable for tightness. See that the gear shift lever is not binding at its pivot.
13. Selector plate or shift bar rattles.
   Correction—Remove transmission case cover and see that flat anti-rattle spring is in place on the selector plate retainer attached to the cover.
14. Gear shift lever hits steering column jacket, or shift shaft lower lever hits jacket when shifting.
   Correction—Adjust eccentric ball stud on transmission cover outer lever to place gear shift lever in approximately horizontal position.
15. Rattle underneath toe board when driving on rough roads.

Correction —Selector control cable may be rattling against speedometer cable. Correct by wrapping friction tape around cables. Selector cable may be rattling against steering column. Install cable and rattle spring.

16. Too much gear shift lever travel when selecting.

Correction —Control cable lock nuts in transmission may be loose.

Disassembly and Assembly of Safety Shift Linkage (See Fig. 5.)

1. Remove front compartment floor mat.
2. Remove center floor panel.
3. Remove steering wheel (Using J-1143 puller).
4. Remove gear shift lever (Using J-1140 remover).
5. Remove the pedal plates.
6. Disconnect the steering column to instrument panel bracket bolts and loosen the bracket clamping bolt.
7. Remove the left hood side panel, disconnect horn wire.
8. Disconnect selector control cable at the lower shift shaft support and remove the lower support.
9. Disconnect the control rod at upper end.
10. Loosen upper support locking bolt and pull upper support and shift shaft assembly up and parallel to steering column jacket. Slide the rubber grommet up to the steering column bracket and slide grommet and bracket off upper end of steering column jacket as shift shaft assembly is being removed.
11. To remove selector rod pull it out through top of shift shaft.
12. Disconnect the outer lever from the transmission cover shift shaft. Lower outer lever and control rod assembly to floor.
13. Remove inspection hole cover from transmission cover.
14. Loosen lock nut on end of the selector control cable and lift the cable out of the selector plate hook.
15. Disconnect the selector cable at the side of the transmission case and pull the end of the cable out through the side.
    Important: Do not kink the selector control cable. Note its location relative to other chassis parts. The cable can be pulled out from either below or at the upper end.
16. Remove the transmission cover screws and lift the cover up through the hole in the center of the floor panel.
    Reverse procedure for reassembly. **Caution:** The selector cable should be assembled to pass below the brake pipe.

CHRYSLER TRANSMISSION AND OVERDRIVE UNIT

Fig. 7 shows the Chrysler transmission and overdrive unit. The transmission is of the synchronized helical gear type. The helical gears make for quiet operation, while as in other synchronized units

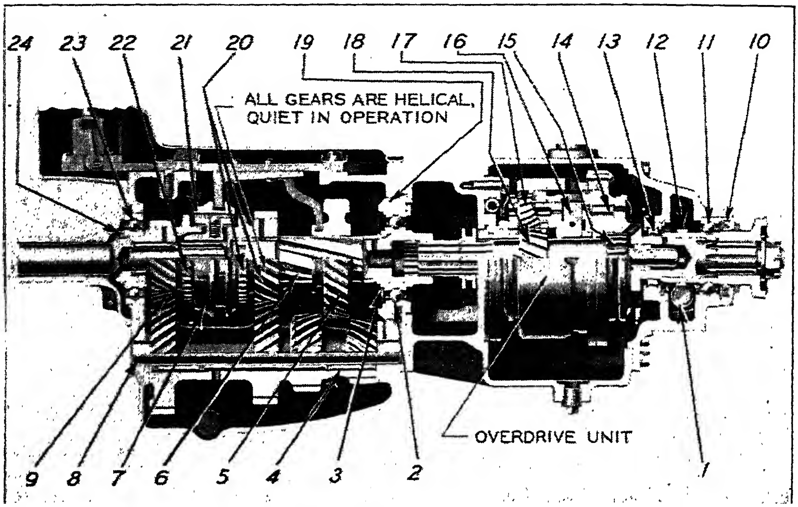


Fig. 7. Chrysler Transmission and Overdrive Unit

1. Speedometer drive pinion
2. Transmission shaft bearing—rear
3. Transmission shaft bearing snap ring
4. Countershaft bearing
5. First and reverse sliding gear
6. Transmission shaft
7. Transmission clutch gear sleeve
8. Countershaft
9. Countershaft gear
10. Overdrive shaft bearing oil seal
11. Overdrive main shaft rear bearing
12. Speedometer drive gear
13. Overdrive main shaft front bearing
14. Free wheeling cam and rollers
15. Overdrive clutch shaft
16. Overdrive clutch pawl and core
17. Overdrive planet pinion and cage
18. Overdrive sun gear
19. Transmission shaft bearing adapter
20. Transmission shaft second speed gear
21. Transmission clutch gear synchronizing ring
22. Transmission drive pinion
23. Transmission drive pinion bearing
24. Transmission drive pinion bearing snap ring

Courtesy of Chrysler Corporation

the synchronizer makes it possible to change gears with little noise.

The proper cut-in speed of the overdrive clutch is set at the time of assembly, and to operate at a speed of from 36 to 40 miles per hour.

The factory does not advocate or recommend any change in this adjustment; however, should adjustment become necessary the following operation should be carried out.

The car should be driven until the lubricant in the overdrive unit is warm, after which the rear wheels should be jacked up and the overdrive unit drained of lubricant.

The transmission gears should then be placed in neutral; and the pawl slots in the clutch gear, with the adjustment opening in the pawl shell and overdrive case, should be lined up by turning the propeller shaft in one direction.

The overdrive control button should be pulled out in the overdrive position, and with an assistant holding down the clutch pedal far enough to permit the propeller shaft to be turned with a slight drag on the clutch, the propeller shaft should be rocked back and forth in short strokes to rotate the pawl core until one of the adjusting screw heads line up with the hole.

To prevent the pawl core from rotating, the clutch should be again engaged and this will prevent the pawl core from rotating while turning the adjusting screw. To increase the cut-in speed, turn the screw in or to the right. To reduce cut-in speed, turn the screw out or to the left two full turns. Two full turns will change the cut-in speed approximately 6 miles per hour.

The other adjusting screw is brought into position by repeating the operation or partially disengaging the clutch while ratcheting the propeller shaft back and forth. Both screws should always be adjusted equal amounts. One screw is made with two screwdriver slots while the other has only a single slot, and this is done to aid in identifying the two screws when adjusting the cut-in speed so as to avoid adjusting the same screw twice.

Care should be taken to see that the screws are not turned too far, otherwise they would interfere with the shell.

STUDEBAKER OVERDRIVE

The overdrive unit, Fig. 8, as fitted to the 1938 Studebaker Commander and President models, as in preceding models, is to reduce the number of engine revolutions at higher car speed. The result of this is an increased efficiency, an unusual quiet high-speed operation and a greater gas economy.

As the engine rotates at a slower speed when the overdrive is in operation, wear on engine parts also is greatly reduced.

The overdrive operates entirely automatically and starts to function at speeds above 40 to 45 miles per hour.

Adjustment of Overdrive. This adjustment is controlled by the setting of the adjusting screws in the overdrive pawl assembly.

The adjustment screws control the spring tension on the pawl and are accurately set at the factory to permit the overdrive to engage at a car speed of between 40 and 45 miles per hour.

The variation in setting is very limited, and the Studebaker Company recommends that the original adjustment be maintained wherever possible.

A correction can be made in the event that the adjustment has been changed.

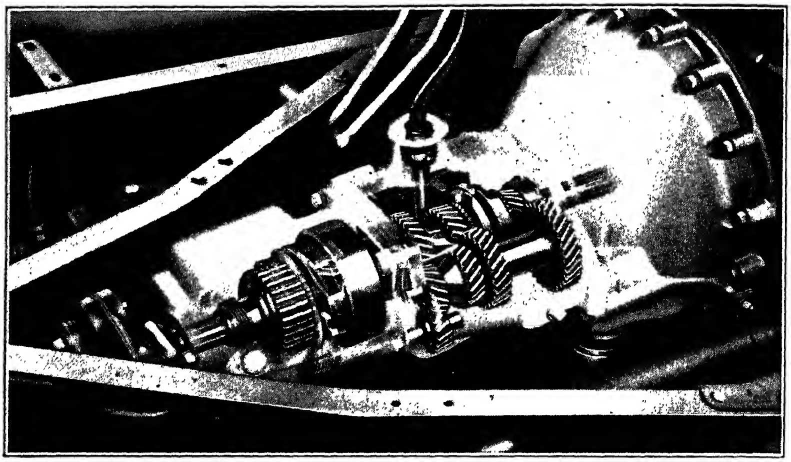


Fig. 8. Phantom View of Studebaker Transmission and Overdrive Unit
Courtesy of Studebaker Corporation

The transmission cover should be removed from the floor and the rear wheels should be jacked up. The plug in the top of the overdrive housing should be removed.

The shift lever should be in neutral free wheeling and then turning the propeller shaft backwards until the opening in the clutch shell and the opening in the overdrive case will enable the operator to see if they are lined up with each other and with adjusting screw.

To increase cut-in, the screw should be turned clockwise and to decrease cut-in the screw should be turned anti-clockwise. Continually rotate this shaft to make the second screw accessible, and then the operation should be repeated, being sure that the screw is turned exactly the same amount and in the same direction as in the case of the first screw.

To avoid the same screw being turned, one screw has a single slot and the other a cross slot. This makes it possible to identify the screws, thus preventing repeating the adjustment accidentally on the same screw.

It is important to see that the screws are not turned out to a point where they will interfere with the clutch shell.

OLDSMOBILE AUTOMATIC TRANSMISSION

The following information is supplied by courtesy of the Oldsmobile Company.

General Description

The Oldsmobile automatic transmission, Fig. 9, will be optional equipment at extra cost on both 6- and 8-cylinder 1938 models.

The automatic transmission comprises many features heretofore unknown in automobile transmissions. The unit consists of the following:

1. Manual Shift Lever and Shift Lever Box
2. Head Gear Set
3. Front Planetary Unit, Brake Band, and Servo
4. Rear Planetary Unit, Brake Band, and Servo
5. Oil Pump
6. Oil Control Unit
7. Governor

Manual Shift Lever

The manual shift lever is located immediately below the steering wheel and directly connected to the transmission through a suitable linkage, which provides a convenient means for the driver to make any necessary manual shifts.

Head Gear Set

The head gear set includes a clutch gear, sliding gear, countershaft, and reverse speed idler gear. By means of the hand shift lever, the sliding gear can be made to mesh with the clutch gear and thus provide a direct coupling with the planetary units and main shaft for forward movement of the car. The sliding gear can also be made to mesh with the reverse idler gear for reverse movement of the car.

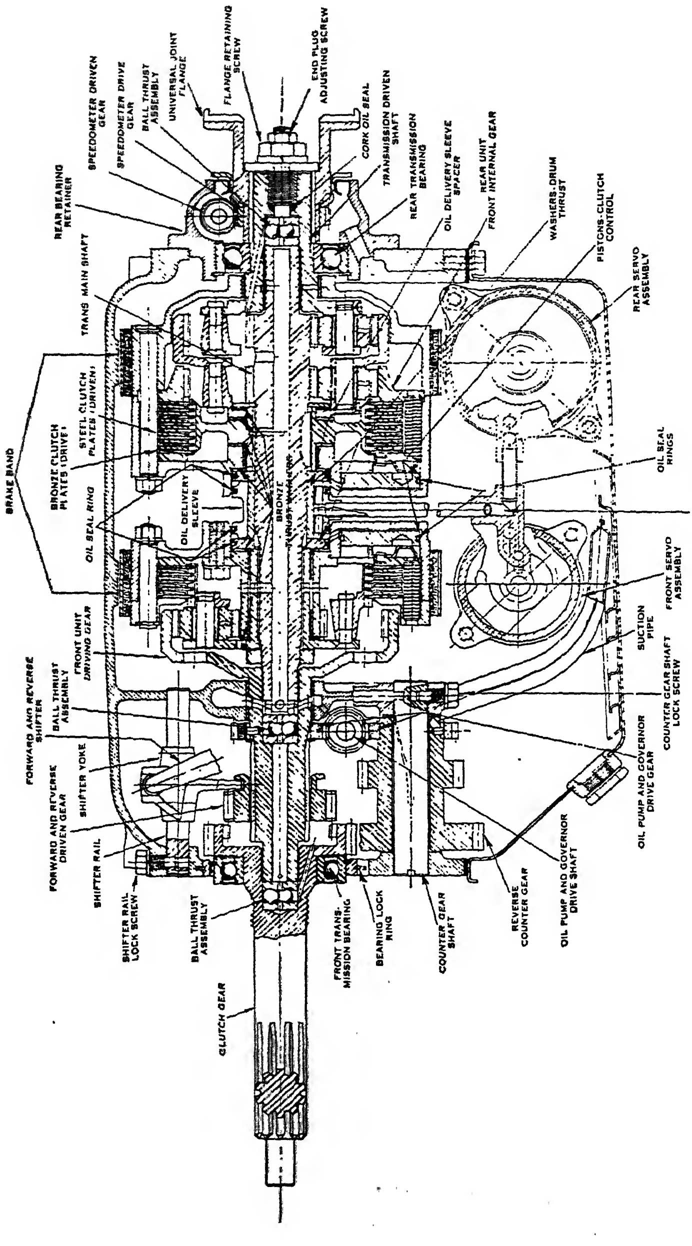


Fig. 9. Oldsmobile Automatic Transmission
Courtesy of Oldsmobile Motor Co.

Front Planetary and Servo

The front planetary unit functions as a speed reduction unit when the brake band is applied to the planetary drum to prevent its rotation. The front planetary unit then becomes a 1.42:1 speed reducing unit.

When the front planetary unit is not functioning as a speed reducing unit, it furnishes a direct coupling through an oil pressure controlled multiple disc clutch to the rear planetary unit. The oil to the clutch is supplied by an oil pump within the transmission.

A front servo unit is located immediately below the front planetary unit. The purpose of the servo unit is to tighten the brake band around the front planetary drum. The brake band is applied by heavy springs located inside the servo and is released by oil pressure applied to the servo piston.

Rear Planetary and Servo

The rear planetary unit functions in a manner comparable to the front unit; however, the speed reduction through the rear unit when locked, is 2.23:1. Because of the greater reduction, the rear planetary unit is larger than the front planetary unit.

When the rear planetary unit is not functioning as a reducing unit, the planetary bands are released and the clutch plates locked by oil pressure the same as on the front unit.

In first gear, both front and rear planetary units are acting as speed reducing units. In second gear, the rear unit functions as a speed reducing gear while the front unit is locked. In third gear, the front unit functions as a speed reducing gear while the rear unit is locked. In fourth gear, both front and rear units are locked (direct drive).

Oil Pump

The oil pump, located inside the transmission performs the dual purpose of supplying lubrication to the various points within the transmission and supplying oil pressure to the planetary unit and servos.

The oil pump has two drive and two driven gears. The larger drive and driven gears are driven off the countershaft and are, therefore, operating any time the engine is running and the clutch engaged.

The smaller drive and driven gears are driven off the main shaft and operate, therefore, only when the rear wheels are turning.

When the car is being towed with the shift lever in the "Neutral" position, the small section of the oil pump **only** is operating to produce sufficient pressure to lubricate the transmission and release the planetary bands.

Oil Control Unit

The discharge from the oil pump flows to the pressure regulator valve where it is distributed to the oil control unit and the lubrication system.

When the transmission is shifted into any forward speed, both the large and small drive and driven gears operate together and force lubrication through the transmission and to the planetary and servo units when required. When the transmission is shifted into reverse, the pump serves to lubricate the transmission parts only.

Distribution of hydraulic pressure (oil controls) to the different points of the transmission, as the changing conditions demand, is controlled by the **three** oil valves which are incorporated in a single valve body.

The **first** valve is known as the rear unit or manually controlled valve, which affects the operation of the rear planetary unit only. The operation of this valve is manually controlled by the position of the hand shift lever.

The **second** valve, known as the front unit or automatic valve, is controlled by the governor. This valve affects the operation of the front planetary unit only.

Note: Up to 58 miles per hour (lockout of throttle), the effect of the governor upon this valve tending to upshift the transmission from third to fourth gear can be overcome by depressing the foot accelerator. Above 70 miles per hour, the governor controls this valve regardless of the position of the accelerator pedal.

A **third** valve is controlled by the throttle position only. This valve affects the operation of both the front and rear planetary units. This valve does not cause any actual shifting, its only function being to bring about smooth shifts at various throttle positions by properly positioning the clutch capacity to the engine torque load which the clutch must carry.

Governor

Within the transmission is a two-stage flyball governor, which affects the operation of the front planetary unit only. The automatic upshifts and downshifts at part throttle occur within the first stage travel. With wide open throttle, the 3rd to 4th shift (forced shifts) occur within the second stage travel. This governor is driven by the same gear on the front unit driving gear which drives the small section of the oil pump. The governor controls the automatic upshifts from first to second gear and from third to fourth gear and the automatic downshifts from second to first gear and from fourth to third gear.

Automatic Transmission Operation

In the automatic transmission, there are two forward driving ranges, namely, "L" (Low), "H" (High), and the usual "R" (Reverse) gear selection and "N" (Neutral) position. The "Low" range of the transmission includes a first and second gear ratio, the "High" range includes a first, third, and fourth gear ratio. The ranges are indicated on a quadrant in connection with the manual shift lever on the steering column just below the steering wheel.

The low range is used for starting a car in motion, rapid acceleration, hill climbing, and easy maneuvering in traffic, or when it is desirable to use the engine as a brake on a hill, etc. The high range is primarily a cruising range and includes a third and fourth gear ratio. Although the car can be started in first gear with the shift lever in high range, this practice is not recommended. The car performance and acceleration will be more satisfactory and transmission life increased if starts are made with the shift lever in the "Low" range position and then shifted to the "High" range position at 20 miles per hour or above.

The fourth gear is a direct drive and the engine speed in this gear is approximately 20% slower than when used with a conventional transmission in high gear.

Possible Shifts and Approximate Speed at Which They Occur

As explained above, there are two driving ranges, "Low" and "High." When driving in the "Low" range, the following shifts will be automatically made at the car speeds shown:

Shift	Car Speed Miles per Hour
Automatic Upshift (1st to 2nd) Part Throttle	9 to 10
Automatic Upshift (1st to 2nd) Full Throttle	22 to 25
Automatic Downshift (2nd to 1st)	4 to 5

When driving in "High" range, the following "automatic" and "pressure" shifts will be made:

Shift	Car Speed Miles per Hour
Pressure Downshift (3rd to 1st) Hot Oil	2
Automatic Upshift (3rd to 4th) Part Throttle	21 to 23
Automatic Upshift (3rd to 4th) Full Throttle (Forced Shift)	65 to 70
Automatic Downshift (4th to 3rd)	18 to 15
Lockout of Throttle Downshift	58 to 62

Note: The above **automatic** shifts are made by the governor and the **pressure** shifts are made by oil pressure.

When driving in fourth gear at part throttle and quick acceleration is needed, if the accelerator is pushed to the floor board, the transmission will immediately downshift into third speed and stay in third speed until 65 to 70 miles per hour is attained, when an automatic shift into fourth speed occurs. This is known as a "Forced Shift from Third to Fourth." The transmission will remain in fourth speed until the car speed has been reduced to from 18 to 15 miles per hour, unless the accelerator pedal is again depressed to the floor board.

When opening the throttle to obtain a throttle downshift into third speed, the governor is over controlled, the throttle linkage operating directly with the governor control linkage.

Important Note: The automatic upshift from third to fourth gear (22 to 25 miles per hour) occurs **only** at this speed with PART THROTTLE. The shift will occur at higher speeds as the throttle opening is increased—when climbing hills, rapid acceleration, etc.

Therefore, the driver has available third and fourth gear at any speeds between 25 to 60 miles per hour. By depressing the accelerator to the floor, an immediate shift is made into third gear and when the accelerator pedal is released, transmission again shifts back into 4th gear.

REAR AXLES

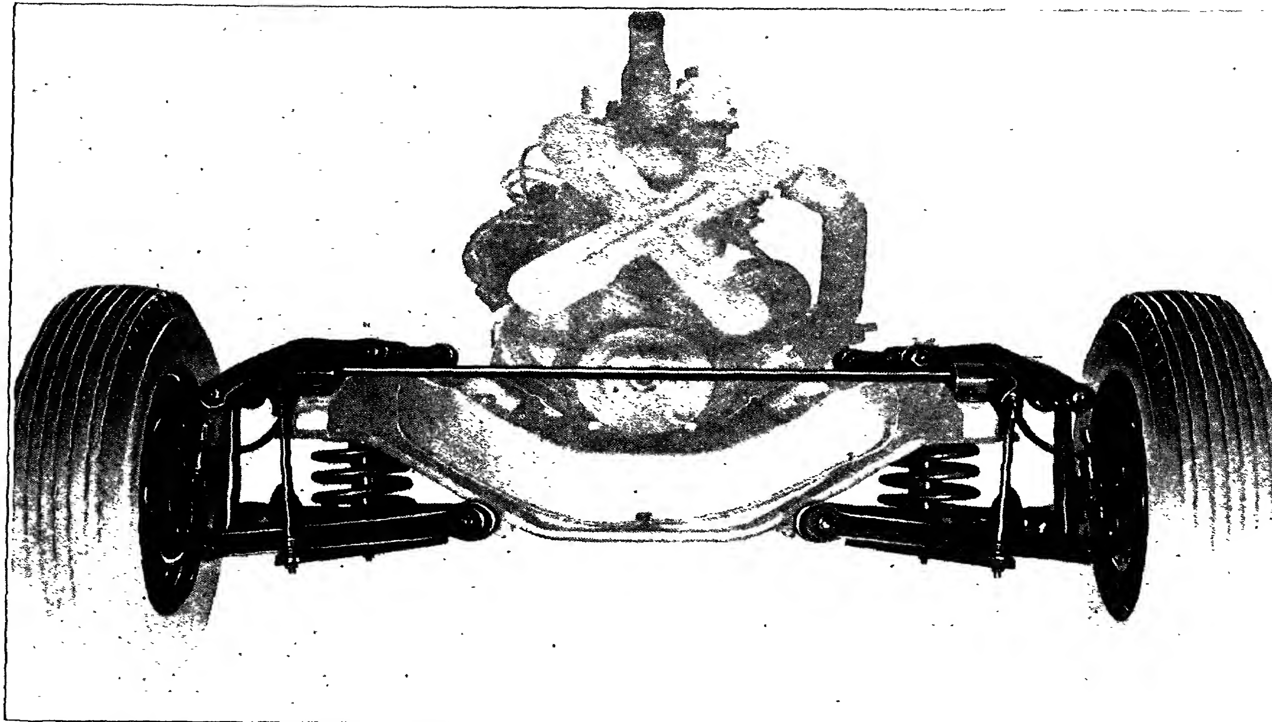
(See Vol. II, bottom folios 413 to 474)

One of the disadvantages found in the cars built in 1937 was the propeller shaft tunnel. This is a raised portion found in the floor of the body of the car. A low center of gravity necessitates a lower body and floor level, and to accommodate the propeller shaft the tunnel was found unavoidable.

In the 1938 cars the manufacturers developed a Hypoid ring and bevel gear which makes it possible to offset the bevel gear from the center line of the ring gear and downward, thus lowering the propeller shaft resulting in the elimination of the shaft tunnel to a very large extent.

To prevent excessive wear of the gears, because of their peculiar construction and greater pressure generated between the gear teeth, a special lubricant has been devised.

In the Buick rear axle the S.A.E. 90 Hypoid lubricant is recommended. New gears of this type should be carefully run in during the early stages of new car or new gear operation. Unless extreme care is taken gears are likely to score and such scoring causes noisy gears. Ordinary 600W lubricant is unsatisfactory in this type of rear axle and it should never be used.



1941 NASH KNEE-ACTION SUSPENSION, INCORPORATING SHOCK ABSORBERS IN CENTER OF THE COIL SPRINGS

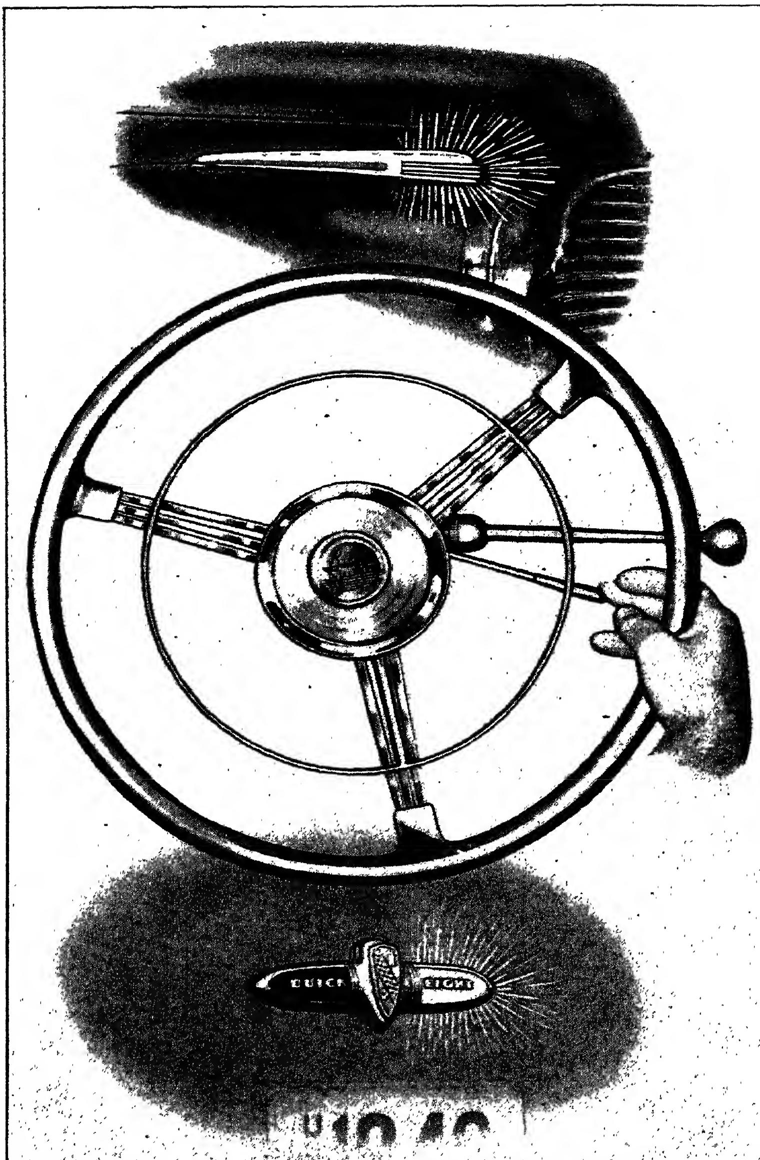
Courtesy of the Nash-Kelvinator Corporation

SPRINGS AND SHOCK ABSORBERS

(See Vol. III, bottom folios 95 to 132)

BUICK REAR SPRING INSTALLATION

The 1938 Buick cars have coil spring suspension at all four wheels, adding greatly to the easy riding qualities of these cars. The rear springs are attached to the frame and rear axle by a cup and bolt which anchor the end coils. The bolts at the upper cup have right-hand threads while those at the lower have left-hand threads. If it is necessary to remove the rear springs for repairs or replacement, the lower end of the shock absorber must be disconnected from the axle bracket, so that the rear end of the car can be raised. This makes it easier to use a wrench on the upper and lower retaining bolts.



BUICK TURN AND DIRECTION INDICATOR
Courtesy of the Buick Motor Division, G.M.S.C.

BATTERY IGNITION MAINTENANCE AND TESTS

(See Vol. IV, bottom folios 111 to 182)

FORD DISTRIBUTOR

Fig. 1 shows a cross-sectional view of the Ford distributor.

The correct timing of the distributor is for the spark to occur four degrees before top dead center.

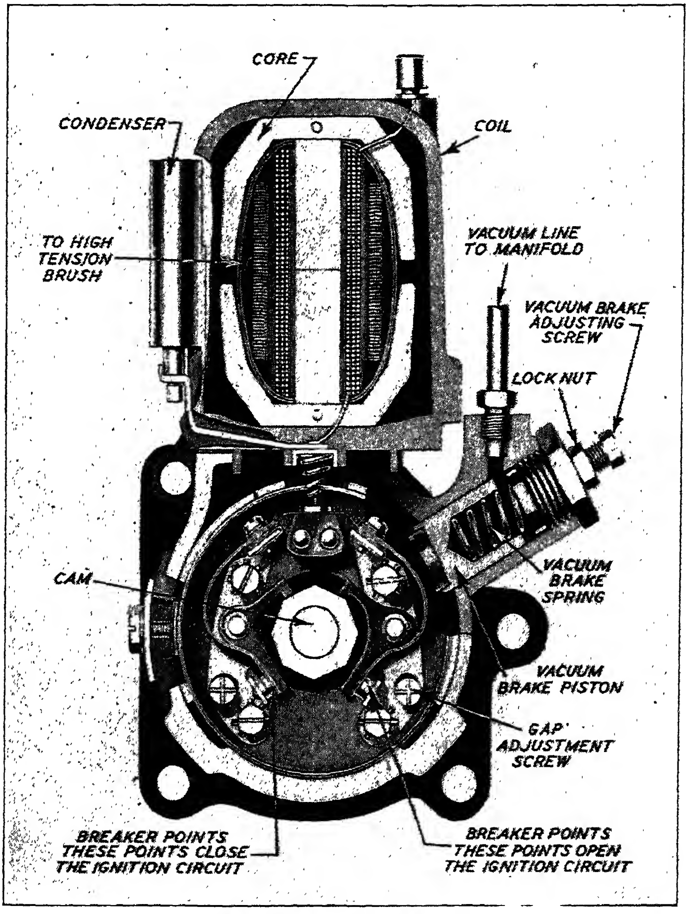


Fig. 1. Ford V-8 Distributor
Courtesy of Ford Motor Co.

As wear takes place on the breaker points, the timing will change slightly. However, if the actual engine spark timing has not been changed, the readjustment to the correct spacing, for the contact points, will automatically re-establish the correct timing.

The breaker points when set correctly should have a spacing of .014″ to .016″. The distributor on the Ford engine is provided with a vacuum retard by means of which the spark is retarded under load in proportion to the load. It is possible to adjust the timing for various grades of gasoline by the aid of a vacuum brake without disturbing or changing the timing of the part throttle operation.

To properly adjust the vacuum brake, loosen the lock nuts as shown in Fig. 1 and back off the adjusting screw until the engine "pings" slightly under load. Next, tighten the adjusting screw just enough to remove the "ping."

BATTERY IGNITION SYSTEMS

(See Vol. IV, bottom folios 83 to 110)

CHRYSLER IGNITION TIMING

As it is not always possible to see ignition timing marks on the engine parts, where such markings are shown, the Chrysler Company suggests the use of a timing light and dial gauge for accurately locating the position of the piston when timing the ignition.

Fig. 1. Timing Light and Dial Gauge Indicator Used for Accurate Ignition Timing
Courtesy of Chrysler Corporation

From the following table, which shows the timing of Chrysler engines with different cylinder heads, it can be seen that for degrees of crankshaft travel piston movement is very slight, and for accurate timing accurate measurements must be made.

Model	Compression Ratio	Cylinder Head	Ignition Setting	Piston Location
C-18	6.5-1	Cast iron	.000″ or 0°	T.D.C.
C-18	7.0-1	Aluminum	.004″ or 3°	A.T.D.C
C-19	6.2-1	Cast iron	.004″ or 3°	B.T.D.C
C-19	6.5-1	Aluminum	.000″ or 0°	T.D.C.
*C-19	7.4-1	Aluminum	.004″ or 3°	A.T.D.C
C-20	6.5-1	Aluminum	.000″ or 0°	T.D.C.
*C-20	7.45-1	Aluminum	.038″ or 9°	A.T.D.C

*Use Ethyl gasoline.

The dial on the instrument shown in Fig. 1 is marked in thousandths of an inch, and the pointer quickly shows the piston position for any degree of crankshaft setting. When timing the ignition, the dial indicator can be placed over No. 6 or No. 8 cylinders. Bring the piston up on the compression stroke until the crankshaft is in the position relative to dead center as given in the table above.

The timing here shown has been established for the regular grade of gasoline of approximately 70 octane rating. Different rated fuels, as well as higher altitudes, affect the amount of ping or detonation present. It is found that best power and economy are obtained when a slight ping is present under full throttle acceleration between 10 and 30 miles per hour with the engine hot. Therefore it is permissible to vary the timing from the above recommendation to give the condition of slight pinging for best performance.

WIRING DIAGRAMS AND DATA SHEETS

CHART OF ABBREVIATIONS

GENERAL

Amps.—Amperes
V.—Volts
C.P.—Candle Power
R.& L. of Firing Order—Right and left determined from driver's seat
Max. Chg. Rate—Maximum Charging Rate
R.P.M.—Revolutions per Minute
D.C.—Double Contact
MM.—Millimeters
Side Lights—Side or Parking Lights
Air Gap—Contacts Closed
Oil—Oil Ring
Comp.—Compression Ring

IGNITION AND VALVE TIMING

B.T.D.C. or B.T.C.—Before Top Dead Center
B.B.D.C. or B.B.C.—Before Bottom Dead Center
A.B.D.C. or A.B.C.—After Bottom Dead Center
A.T.D.C. or A.T.C.—After Top Dead Center
T.D.C. at Retard—Top Dead Center; Spark Control Retarded
12° past T.D.C.—Piston 12° past T.D.C. Spark Control Retarded
2½" before T.D.C.—Piston 2½", on Flywheel, before T.D.C.
"Ret" at Retard—Marks "Ret" on Flywheel

LUBRICATION SYSTEM

Gals.—Gallons
Qts.—Quarts
Press.—Pressure to Main Bearings
Splash—Pressure Circulating Splash
Splash—Connecting Rod Dips

REAR AXLE

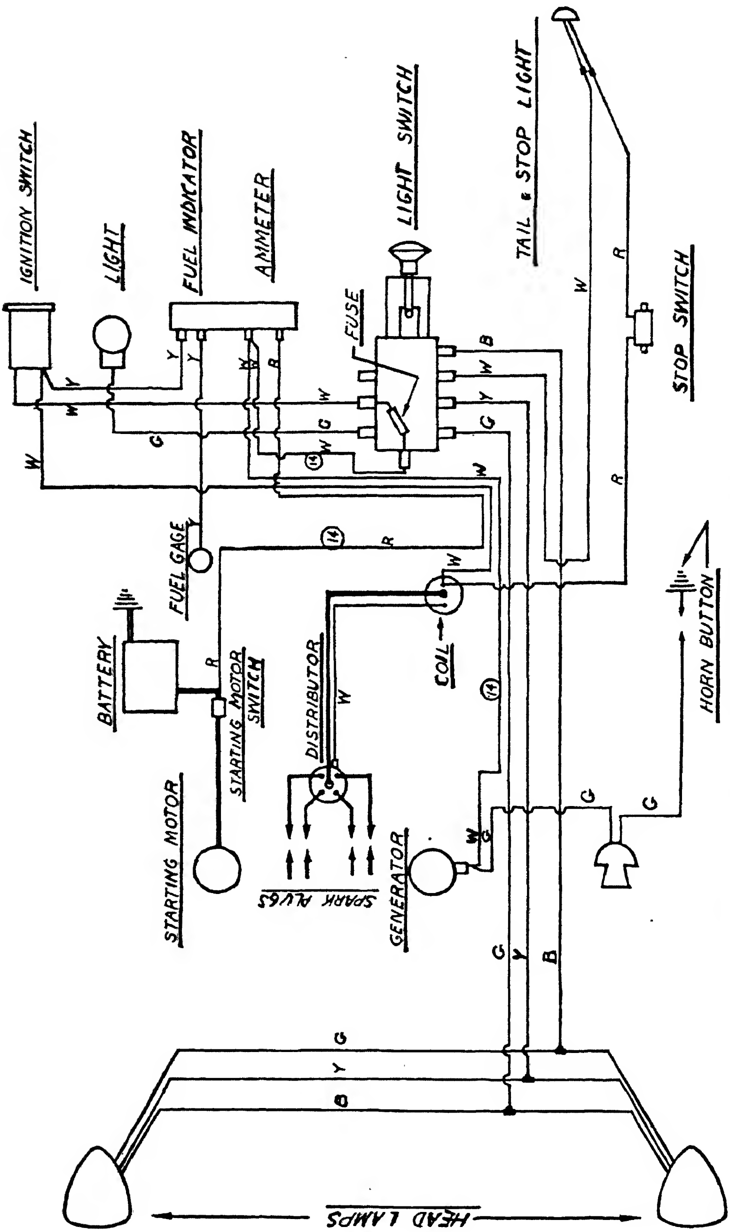
Semi—Semi-Floating
¾ Flt.—Three-quarters Floating
Full Flt.—Full Floating

CLUTCH

Disc.—Multiple disc, either wet or dry
Plate—Single or Double Plate Type

BRAKES

Front—Front Wheels
Rear—Rear Wheels
Hand—Hand Brake
Trans.—Transmission Brake



AMERICAN BANTAM WIRING DIAGRAM, 1938, MODEL 4-CYLINDER
Courtesy of American Bantam Automobile Company

American Bantam **Model 4-Cylinder** **Year 1938 Series**

Battery Willard **Type** 11 Plates **Volts** 6 **Amps.** 65
Frame Connection

Lighting **Head Lights**
Dash, Tail and Stop
Side Lights

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 10 Amps. **Speed** 2900 R.P.M.
Regulation **Cut-in** 7 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .018″-.022″
Spark Plug—Size **Gap** .025″
Firing Order 1-3-4-2
Timing 2° B.T.C.

Engine **Bore** 2.2″ **Stroke** 3″ **Taxable H.P.** 7.8
Piston Ring—Width Oil 1—1/8″, Comp. 2—3/32″
Diam. 2.2″ **Gap** .004″ to .006″
Oiling—Type Pressure and Splash **Capacity** 6 Pints

Valves **Intake Timing—Open** 19° B.T.C. **Close** 50° A.B.C.
Intake Clearance .006″ Warm
Exhaust Timing—Open 57° B.B.C. **Close** 12° A.T.C.
Exhaust Clearance .009″ Warm

Carburetor Tillotson

Cooling System Thermo **Type** **Capacity** 6 Qts.

Steering Camber 2¾°, Caster 5°, Toe In 3/32″ ± 1/32″

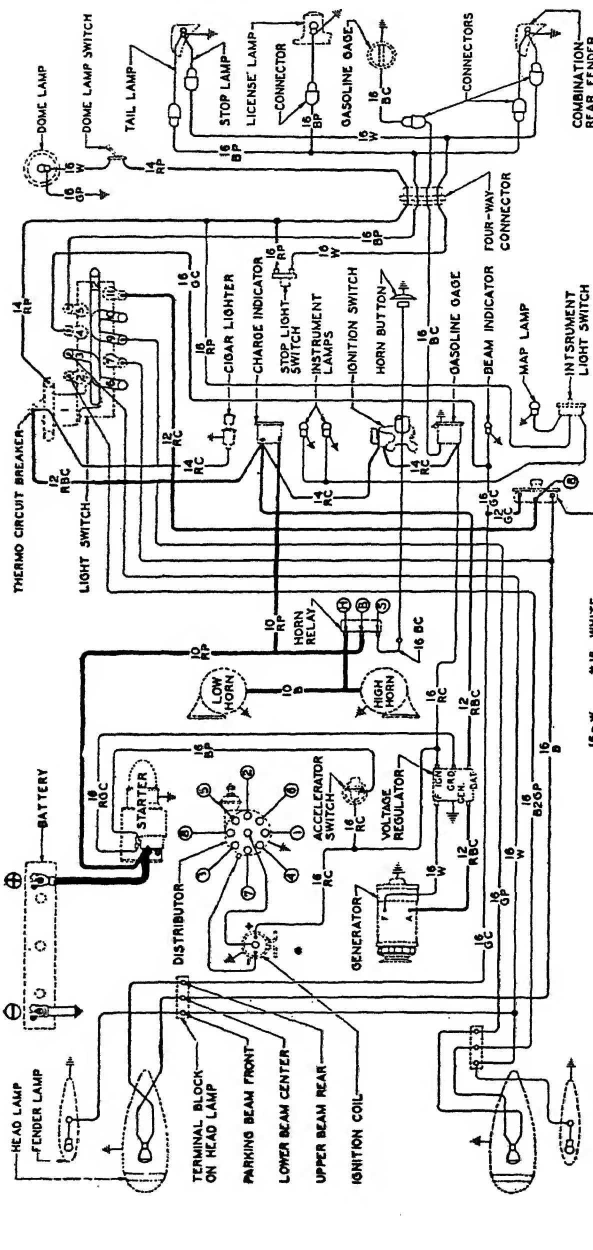
Clutch Rockford **Facings** Moulded 6½″ x 8 7/16″ x 1/8″ 2 Required

Gear Ratio Spiral Gears

Axle Semi-Floating

Brakes **Front** 17″ x 1 1/8″ x 3/16″
Mechanical **Rear** 17″ x 1 1/8″ x 3/16″
Hand Rear Service
Lining Semi-Moulded

Diagram 38–1



10-B	#10	BLACK
10-RP	#10	RED PARALLEL TRACERS
12-RC	#12	RED CROSSING TRACERS
12-RBC	#12	RED AND BLACK CROSSING TRACERS
12-GC	#12	GREEN CROSSING TRACERS
14-RP	#14	RED PARALLEL TRACERS
14-RC	#14	RED CROSSING TRACERS
16-BP	#16	BLACK PARALLEL TRACERS
16-W	#16	WHITE
16-B	#16	BLACK
16-ROC	#16	RED AND GREEN CROSSING TRACERS
16-B2GP	#16	BLACK WITH 2 GREEN PARALLEL TRACERS
16-RP	#16	RED PARALLEL TRACERS
16-GP	#16	GREEN PARALLEL TRACERS
16-BC	#16	BLACK CROSSING TRACERS
16-RC	#16	RED CROSSING TRACERS
16-GC	#16	GREEN CROSSING TRACERS

BUICK WIRING DIAGRAM, 1938, SERIES 40-60
Courtesy of Buick Motor Company

Buick **Model 8-Cylinder** **Year 1938 Series 40-60**

Battery Delco-Remy **Type** 17EI-W **Volts** 6-8 **Amps.** 110
Frame Connection Negative

Lighting Mazda 2320L **Head Lights** 32-21 C.P., 6-8 Volts
1154 **Dash, Tail and Stop** 21-3 C.P., 6-8 Volts
55 **Side Lights** 1.5 C.P., 6-8 Volts

Starter and Generator Delco-Remy

Generator Cold **Max. Chg. Rate** 28-31 Amps. **Speed** 40 Miles per Hour
Delco-Remy **Regulation** 3rd Brush, Voltage **Cut-in** 6.4 to 7 Volts Cold
Relay Air Gap **Contact Gap** .018″-.025″

Ignition **Contact Breaker Gap** .0125″-.0175″
Delco-Remy **Spark Plug—Size** 14 M.M. A.C. **Gap** .023″-.028″
Firing Order 1-6-2-5-8-3-7-4
Timing 4° on 40, 6° on 60 full advance

Bore 40-3³⁄₃₂″, 60-3⁷⁄₁₆″ **Stroke** 4⅛″, 4⁵⁄₁₆″ **Taxable H.P.** 30.63

Piston Ring—Width Oil ³⁄₁₆″ Comp. ⅛″ and ³⁄₃₂″
Diam. ³⁄₃₂″, 3⁷⁄₁₆″ **Gap** Oil .010″-.015″ Comp. .010″-.015″

Oiling—Type Pump **Capacity** 40—6 Qts. 60—8 Qts.

Valves **Intake Timing—Open** 40—13°, **Close** 40—60° A.B.C.
60—14° B.T.C. 60—71° A.B.C.

Intake Clearance .0015″-.0035″

Exhaust Timing—Open 40—55°, **Close** 40—22° A.T.C.
60—56° B.B.C. 60—25° A.T.C.

Exhaust Clearance .0021″—.0039″

Carburetor Stromberg or Marvel

Cooling System Centrifugal **Type** Pump **Capacity** 40—13¼ Qts.
60—17 Qts.

Steering Camber —¼° to +1° Caster ⅞° ± ⅜° Reverse Toe In 0″

Clutch Plate **Facings** 40—10″ x 6″, 60—11″ x 6½″ Woven 2 Required

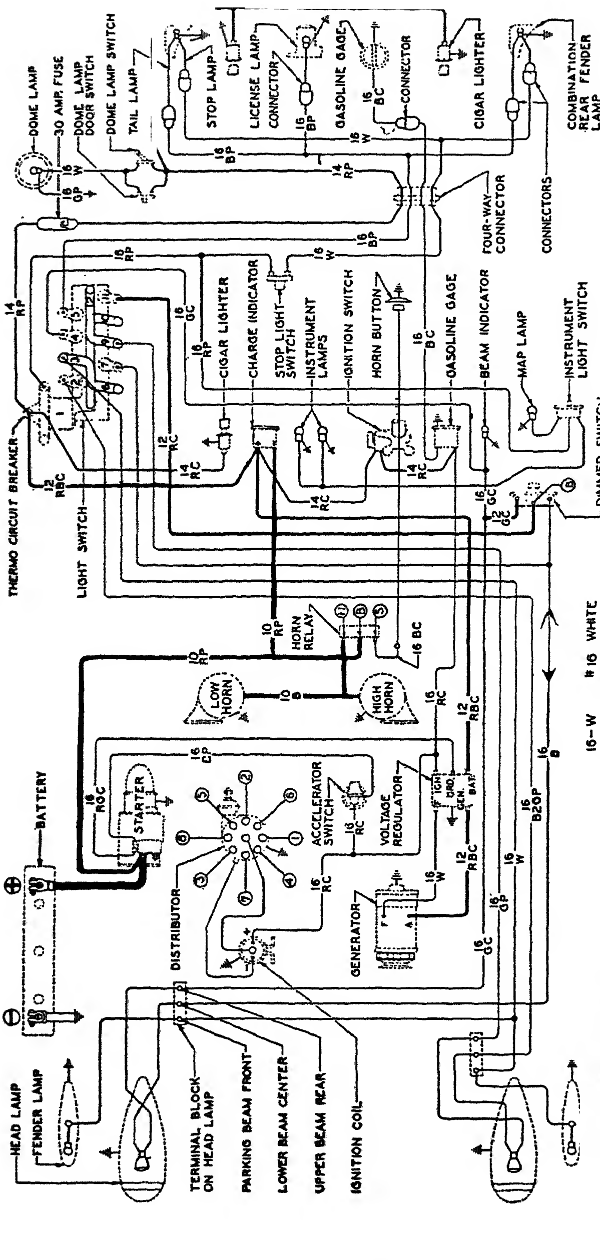
Gear Ratio 40—Ring Gear 44 Pinion 10
60—Ring Gear 39 Pinion 11

Axle Semi-Floating Hypoid Spiral Bevel Gears

Brakes Bendix Hydraulic
- **Front** Primary 40—9⁵⁄₁₆″ x 1¾″ x ³⁄₁₆″ 60—9¹⁵⁄₁₆″ x 2″ x ³⁄₁₆″
- **Rear** Secondary 40—12¾″ x 1¾″ x ³⁄₁₆″ 60—12¾″ x 2″ x ³⁄₁₆″
- **Hand** Rear Service

Lining Primary Shoe Woven, Secondary Shoe Moulded

Diagram 38-2



10-B	#10	BLACK
10-RP	#10	RED PARALLEL TRACERS
12-RC	#12	RED CROSSING TRACERS
12-RBC	#12	RED AND BLACK CROSSING TRACERS
12-GC	#12	GREEN CROSSING TRACERS
14-RP	#14	RED PARALLEL TRACERS
14-RC	#14	RED CROSSING TRACERS
16-BP	#16	BLACK PARALLEL TRACERS

16-W	#16	WHITE
16-B	#16	BLACK
16-ROC	#16	RED AND GREEN CROSSING TRACERS
16-B2GP	#16	BLACK WITH 2 GREEN PARALLEL TRACERS
16-RP	#16	RED PARALLEL TRACERS
16-GP	#16	GREEN PARALLEL TRACERS
16-BC	#16	BLACK CROSSING TRACERS
16-RC	#16	RED CROSSING TRACERS
16-GC	#16	GREEN CROSSING TRACERS

BUICK WIRING DIAGRAM, 1938, SERIES 80-90
Courtesy of Buick Motor Company

Buick Model 8-Cylinder Year 1938 Series 80-90

Battery Delco-Remy **Type** 17E1-W **Volts** 6-8 **Amps.** 110
Frame Connection Negative

Lighting Mazda 2320L **Head Lights** 32-21 C.P. 6-8 Volts
1154 **Dash, Tail and Stop** 21-3 C.P., 6-8 Volts
55 **Side Lights** 1.5 C.P., 6-8 Volts

Starter and Generator Delco-Remy

Generator Delco-Remy
Max. Chg. Rate 28-31 Amps. **Speed** 40 Miles per Hour
Regulation 3rd Brush, Voltage **Cut-in** 6.4 to 7 Volts Cold
Relay Air Gap **Contact Gap** .018″-.025″

Ignition Delco-Remy
Contact Breaker Gap .0125″-.0175″
Spark Plug—Size 14 M.M. A.C. **Gap** .023″-.028″
Firing Order 1-6-2-5-8-3-7-4
Timing 6° Full Advanced

Engine **Bore** 3 7/16″ **Stroke** 4 5/16″ **Taxable H.P.** 37.81
Piston Ring—Width Oil 3/16″ Com., 1/8″ and 3/32″
Diam. 3 7/16″ **Gap** Oil .010″-.015″
Oiling—Type Pump **Capacity** 9 Qts.

Valves **Intake Timing—Open** 14° B.T.C. **Close** 71° A.B.C.
Intake Clearance .0015″-.0035″
Exhaust Timing—Open 56° B.B.C. **Close** 25° A.T.C.
Exhaust Clearance .0021″-.0039″

Carburetor Stromberg or Marvel

Cooling System Centrifugal **Type** Pump **Capacity** 17 Qts.

Steering Camber —1/4° to +1° Caster Reverse 7/8° ± 3/8° Reverse Toe In 0″

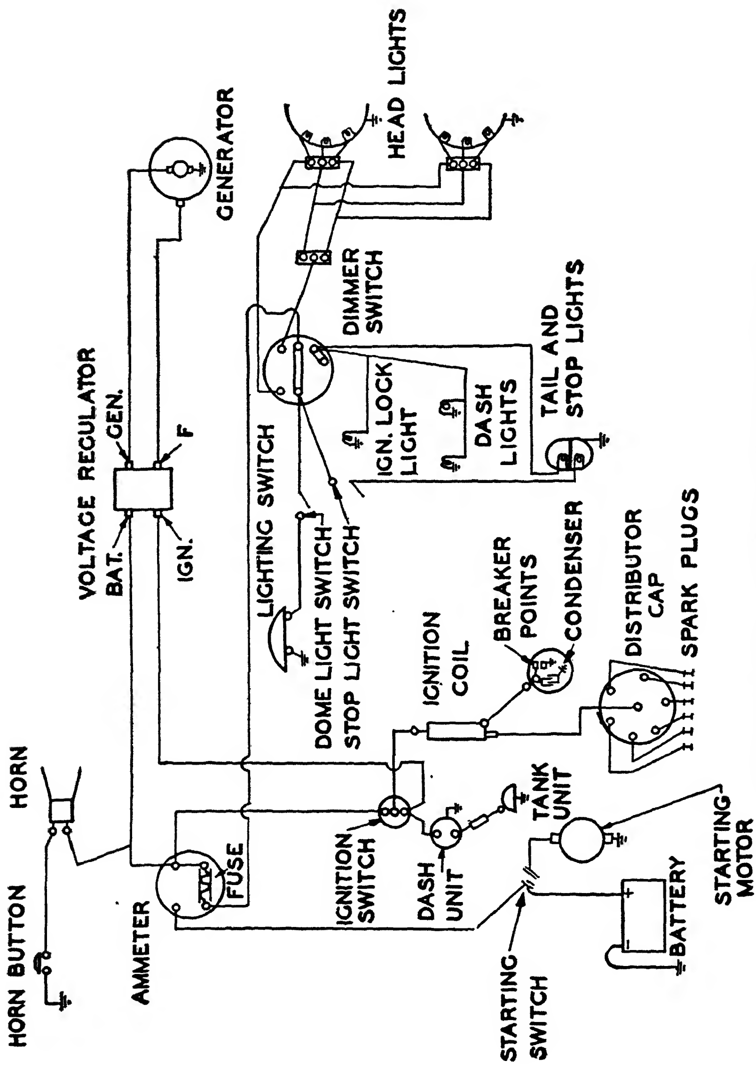
Clutch Plate **Facings** Woven 11″ x 6 1/2″ 2 Required

Gear Ratio 80—Ring Gear 46 Pinion 11
90—Ring Gear 41 Pinion 9

Axle Semi-Floating Hypoid Spiral Bevel Gears

Brakes Bendix Hydraulic
Front Primary 80— 9 15/16″ x 2″ x 3/16″ 90—12 1/16″ x 2″ x 1/4″
Rear Secondary 80—12 3/4″ x 2″ x 3/16″ 90—14 3/4″ x 2″ x 1/4″
Hand Rear Service
Lining Primary Shoe Woven, Secondary Shoe Moulded

Diagram 38-3



CHEVROLET WIRING DIAGRAM, 1938, MODEL 6-CYLINDER
Courtesy of Chevrolet Motor Company

Chevrolet Model 6-Cylinder **Year 1938 Series**

Battery Delco **Type** 17M **Volts** 6 **Amps.** 100
Frame Connection Negative

Lighting **Head Lights** 6-8 Volts
Dash, Tail and Stop 6-8 Volts
Side Lights 6-8 Volts

Starter and Generator Delco-Remy

Generator Cold **Max. Chg. Rate** 26-30 Amps. **Speed** 35 M.P.H.
Regulation 3rd Brush, Voltage **Cut-in** 7.5 Volts
Relay Air Gap .060"-.070" **Contact Gap** .015"-.025"

Ignition Delco **Contact Breaker Gap** .018"
Spark Plug—Size A.C. 46 **Gap** .040"
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Engine **Bore** $3\frac{1}{2}$" **Stroke** $3\frac{3}{4}$" **Taxable H.P.** 29.4
Piston Ring—Width Oil 1—$\frac{3}{16}$" Comp. 2—$\frac{1}{8}$"
Diam. $3\frac{1}{2}$" **Gap** .005"
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 9° B.T.C. **Close** 29° A.B.C.
Intake Clearance .006" to .008" Hot
Exhaust Timing—Open 52° B.B.C. **Close** 1° B.T.C.
Exhaust Clearance .013" to .015" Hot

Carburetor Carter WL-$1\frac{1}{4}$"

Cooling System Centrifugal **Type** Pump **Capacity** 14 Qts.

Steering Camber $\frac{1}{2}$° Caster $1\frac{3}{4}$° Toe In $\frac{5}{64}$"

Clutch Plate **Facings** Woven $6\frac{1}{4}$" x 9" x $\frac{1}{8}$" 2 Required

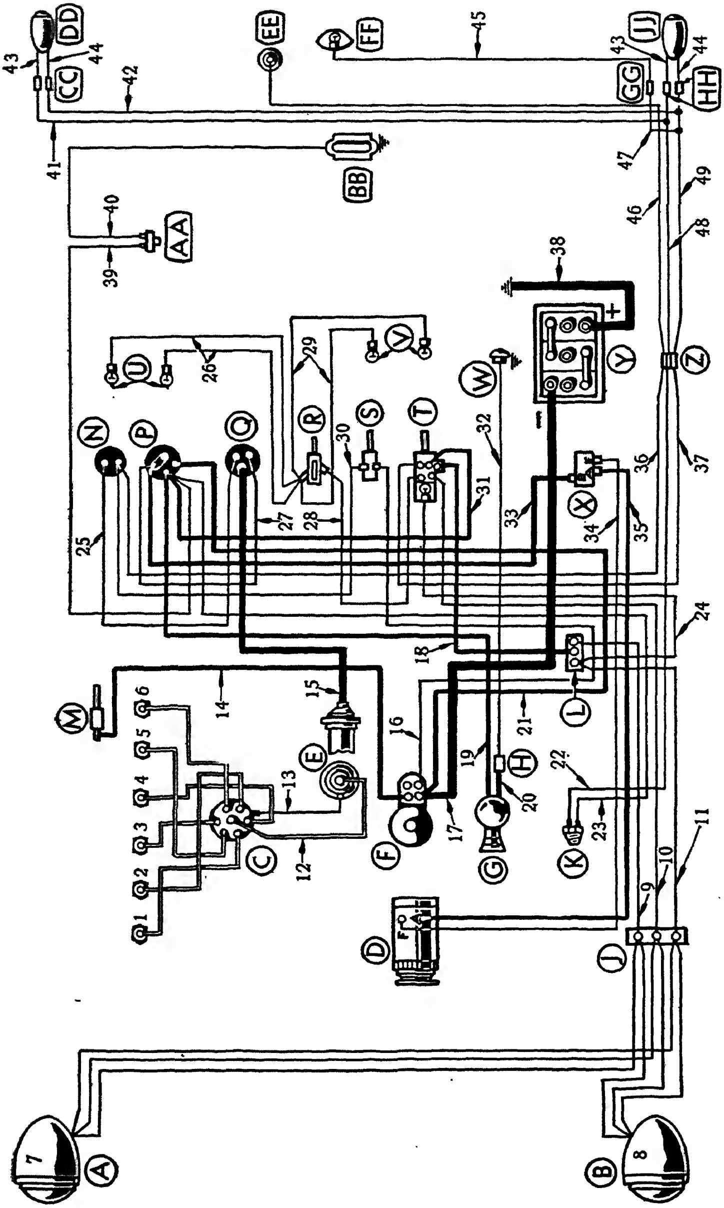
Gear Ratio 4.22 to 1

Axle Semi-Floating Hypoid Gears

Brakes Bendix Hydraulic
- **Front** $22\frac{5}{8}$" x $1\frac{3}{4}$" x $\frac{3}{16}$" Clearance Slight Drag
- **Rear** $22\frac{5}{8}$" x $1\frac{3}{4}$" x $\frac{3}{16}$" Back 4 Notches
- **Hand** Rear Service

Lining Moulded

Diagram 38-4



CHRYSLER WIRING DIAGRAM, 1938, MODEL 6-CYLINDER

Courtesy of Chrysler Corporation

Chrysler Model 6-Cylinder Year 1938 Series Royal

Battery	Willard	**Type** 15 Plate	**Volts** 6	**Amps.** 119
		Frame Connection	Positive	
Lighting	Mazda 2331	**Head Lights**	32-32 C.P., 6-8 Volts	
	Mazda 55-1158	**Dash, Tail and Stop**	1½-2-21 C.P., 6-8 Volts	
	Mazda 55	**Side Lights**	1½ C.P., 6-8 Volts	

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 28 Amps. **Speed** 1900 to 2430 R.P.M.
Regulation 3rd Brush, Voltage **Cut-in**
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 14 M. M. Champion **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing Cast-Iron Head T.D.C. Aluminum Head 3° A.T.C.

Engine **Bore** 3⅜″ **Stroke** 4½″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3⅜″ **Gap** .007″ to .015″
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 8° B.T.C. **Close** 42° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 48° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance .010″ Hot

Carburetor Carter BB

Cooling System Centrifugal **Type** Pump **Capacity** 5 Gals.

Steering Caster ½° to 2½° Camber −¼° to +½° Toe In 1/16″

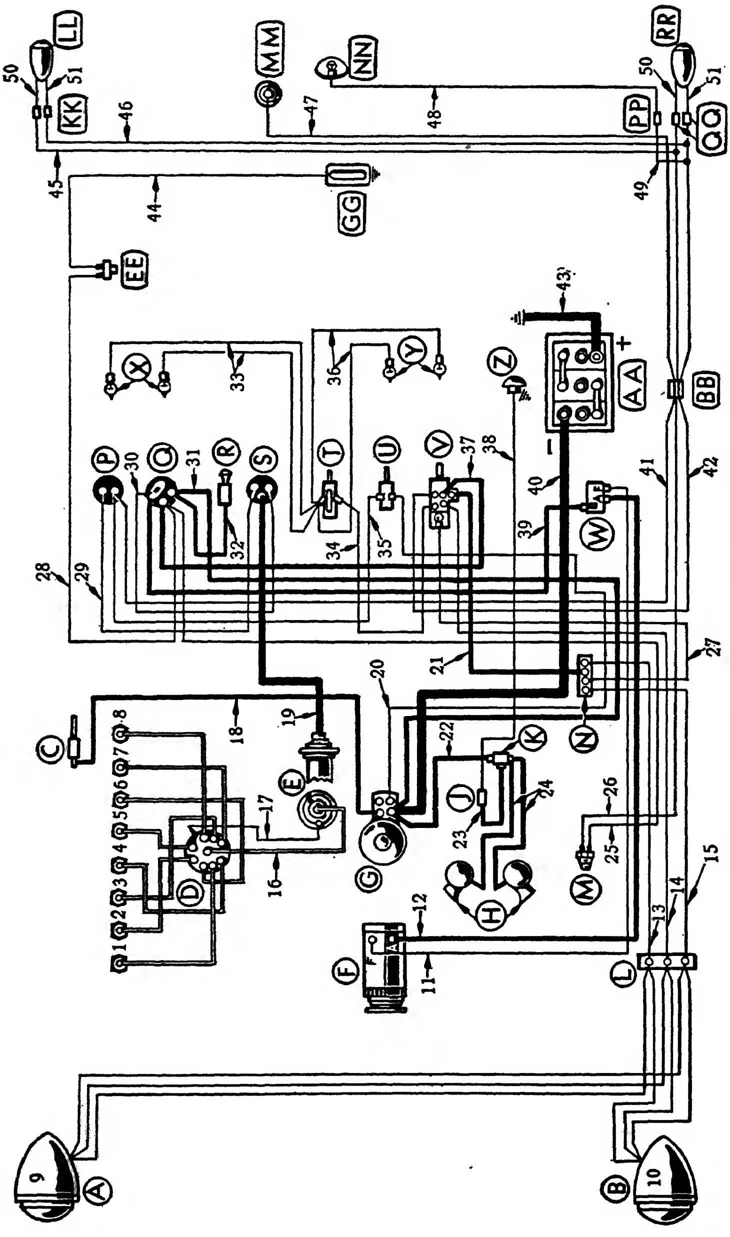
Clutch Borg & Beck **Facings** Woven 6″ x 10″ x ⅛″ 2 Required

Gear Ratio Ring Gear 41 Pinion 10 Hypoid Gears

Axle Semi-Floating

Brakes Lockheed Hydraulic
- **Front** 19½″ x 2″ x 13/64″ Clearance Heel .006″ Toe .010″
- **Rear** 19½″ x 2″ x 13/64″ Clearance Heel .006″ Toe .010″
- **Hand** 17 1/16″ x 2″ x 5/32″ Trans. Clearance .025″

Lining Moulded Diagram 38-5



CHRYSLER WIRING DIAGRAM, 1938, MODEL 8-CYLINDER
Courtesy of Chrysler Corporation

Chrysler **Model 8-Cylinder** **Year 1938** **Series Imperial**

Battery	Willard	**Type** 17 Plate	**Volts** 6	**Amps.** 120
		Frame Connection	Positive	
Lighting	Mazda 2331	**Head Lights**	32-32 C.P., 6-8 Volts	
	Mazda 55-1158	**Dash, Tail and Stop**	1½-3-21 C.P., 6-8 Volts	
	Mazda 55	**Side Lights**	1½ C.P., 6-8 Volts	

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 28 Amps. **Speed** 2200 R.P.M.
Regulation 3rd Brush, Voltage **Cut-in**
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .018″
Spark Plug—Size 14 M. M. Champion **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing Cast-Iron Head 3° B.T.C., Aluminum Head T.D.C.

Engine **Bore** 3¼″ **Stroke** 4½″ **Taxable H.P.** 33.80
Piston Ring—Width Oil 2—5/32″ Comp. 2—⅛″
Diam. 3¼″ **Gap** .007″ to .015″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 2° B.T.C. **Close** 44° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 46° B.B.C. **Close** 4° A.T.C.
Exhaust Clearance .010″ Hot

Carburetor Stromberg AAV2

Cooling System Centrifugal **Type** Pump **Capacity** 20 Qts.

Steering Caster ½° to 2½° Camber −¼° to +½° Toe In 1/16″

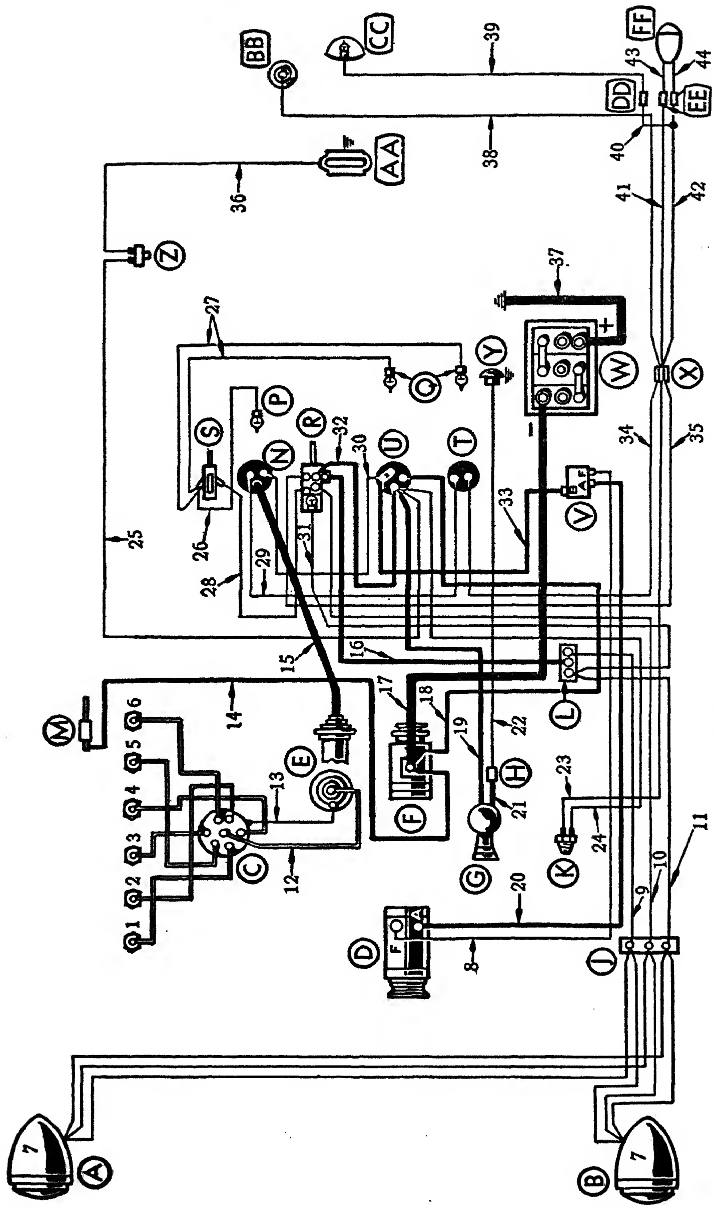
Clutch Borg & Beck **Facings** Woven 6⅛″ x 11″ x ⅛″ 2 Required

Gear Ratio Ring Gear 43 Pinion 11 Hypoid Gears

Axle Semi-Floating

Brakes Lockheed Hydraulic	**Front**	21 9/16″ x 2″ x 13/64″	Clearance Heel .006″ Toe .010″
	Rear	21 9/16″ x 2″ x 13/64″	Clearance Heel .006″ Toe .010″
	Hand	17 1/16″ x 2″ x 5/32″	Trans. Clearance .025″

Lining Moulded **Diagram** 38-6



DE SOTO WIRING DIAGRAM, 1938, MODEL 6-CYLINDER
Courtesy of Chrysler Corporation

De Soto **Model 6-Cylinder** **Year 1938** **Series**

Battery	Willard	**Type** 15 Plate	**Volts** 6	**Amps.** 105
		Frame Connection	Positive	
Lighting	Mazda 2331	**Head Lights**	32-32 C.P., 6-8 Volts	
	Mazda 55 & 1158	**Dash, Tail and Stop**	1½, 3, 21 C.P., 6-8 Volts	
	Mazda 55	**Side Lights**	1½ C.P., 6-8 Volts	

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 28 Amps. **Speed** 2420 R.P.M.
Regulation 3rd Brush, Voltage **Cut-in** 6.4 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 14 M. M., Auto Lite **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing Standard T.D.C., Aluminum Head 3° A.T.C.

Engine **Bore** 3⅜″ **Stroke** 4¼″ **Taxable H.P.** 27.34
Piston Ring—Width Oil 2—5/32″ **Comp.** 2—⅛″
Diam. 3⅜″ **Gap** .007″ to .015″
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 8° B.T.C. **Close** 42° A.B.C.
Intake Clearance .008″ Hot
Exhaust Timing—Open 48° B.B.C. **Close** 2° A.T.C.
Exhaust Clearance .010″ Hot

Carburetor Carter BB

Cooling System Centrifugal **Type** Pump **Capacity** 5 Gallons

Steering **Caster** ½° **Camber** ¼° **Toe In** 1/16″

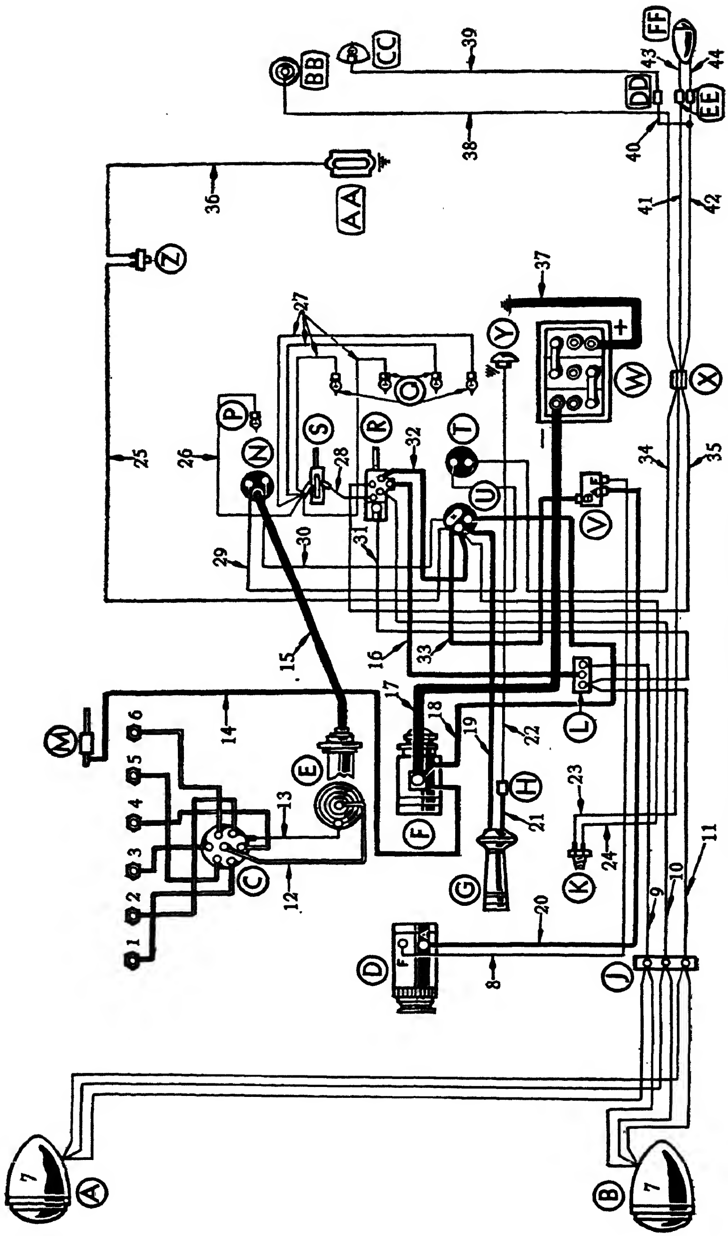
Clutch Borg & Beck **Facings** Woven 6″ x 10″ x ⅛″ 2 Required

Gear Ratio **Ring Gear** 41 **Pinion** 10 Hypoid Gears

Axle Semi-Floating

Brakes Lockheed Hydraulic	**Front** 18¾″ x 2″ x 13/64″	**Clearance Heel** .006″	**Toe** .010″
	Rear 18¾″ x 2″ x 13/64″	**Clearance Heel** .006″	**Toe** .010″
	Hand 17 1/16″ x 2″ x 5/32″	**Transmission Clearance** .025″	

Lining Moulded Diagram 38-7



DODGE WIRING DIAGRAM, 1938, MODEL 6-CYLINDER
Courtesy of Chrysler Corporation

Dodge **Model** 6-Cylinder **Year** 1938 **Series**

Battery	Willard	**Type** 15 Plate	**Volts** 6	**Amps.** 92
		Frame Connection	Positive	
Lighting	Mazda 2331	**Head Lights**	32-32 C.P., 6-8 Volts	
	Mazda 55, 1158	**Dash, Tail and Stop**	1½-21-3 C.P., 6-8 Volts	
	Mazda 55	**Side Lights**	1½ C.P., 6-8 Volts	

Starter and Generator Auto-Lite

Generator	Hot	**Max. Chg. Rate** 28 Amps.	**Speed** 2500 R.P.M.
		Regulation 3rd Brush, Voltage	**Cut-in** 7 Volts
		Relay Air Gap	**Contact Gap**
Ignition		**Contact Breaker Gap** .022″	
		Spark Plug—Size 14 M.M.	**Gap** .025″
		Firing Order 1-5-3-6-2-4	
		Timing T.D.C.	

Engine	**Bore** 3¼″	**Stroke** 4⅜″	**Taxable H.P.** 25.35
	Piston Ring—Width Oil 2—5/32″	Comp. 2—⅛″	
	Diam. 3¼″	**Gap** .007″	
	Oiling—Type Pump	**Capacity** 5 Qts.	
Valves	**Intake Timing—Open** 6° A.T.C.	**Close** 46° A.B.C.	
	Intake Clearance .006″ Hot		
	Exhaust Timing—Open 42° B.B.C.	**Close** 8° A.T.C.	
	Exhaust Clearance .008″ Hot		

Carburetor Stromberg EXV2

Cooling System Centrifugal **Type** Pump **Capacity** 15 Qts.

Steering Camber ½° Caster 2° Toe In 0″

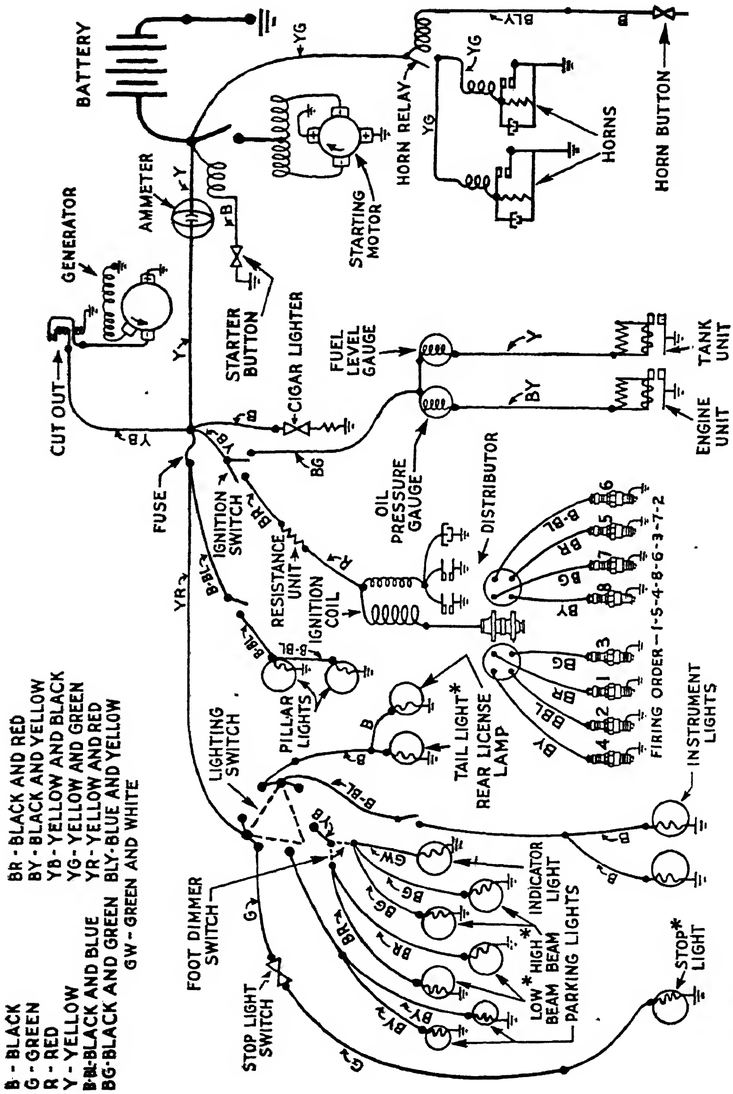
Clutch Borg & Beck **Facings** Woven 6″ x 10″ x ⅛″ 2 Required

Gear Ratio Ring Gear 41 Pinion 10 Hypoid Gear

Axle Semi-Floating

Brakes Lockheed Hydraulic	**Front** 18¾″ x 2″ x 13/64″	Clearance Heel .006″	Toe .010″
	Rear 18¾″ x 2″ x 13/64″	Clearance Heel .006″	Toe .010″
	Hand 17¾″ x 2″ x 5/32″	Trans. Clearance .025″	
	Lining Moulded		

Diagram 38-8



FORD WIRING DIAGRAM, 1938, SERIES V-8-85, V-8-60
Courtesy of Ford Motor Company

Ford **Model 8-Cylinder** **Year 1938** **Series V-8-85, V-8-60**

Battery	Own	**Type**	**Volts** 6	**Amps.** 100
		Frame Connection	Positive	
Lighting		**Head Lights**	6-8 Volts	
		Dash, Tail and Stop	6-8 Volts	
		Side Lights	6-8 Volts	

Starter and Generator Own

Generator Own — **Max. Chg. Rate** 18 Amps. — **Speed**
Regulation 3rd Brush — **Cut-in** 7 Volts, 10 M.P.H.
Relay Air Gap — **Contact Gap**

Ignition — **Contact Breaker Gap** .014″
Spark Plug—Size 60—14 M.M., 85-18 M.M. — **Gap** .025″
Firing Order 1-5-4-8-6-3-7-2
Timing

Engine — **Bore** 3.062″ — **Stroke** 3.75″ — **Taxable H.P.** 30
Piston Ring—Width Oil 1—$\frac{5}{32}$″ Comp. 2—$\frac{3}{32}$″
Diam. 3.062″ — **Gap Oil** .005″ Comp. .009″
Oiling—Type Pump — **Capacity** 5 Qts. 85; 4 Qts. 60

Valves — **Intake Timing—Open** 9½° B.T.C. — **Close** 54½° A.B.C.
Intake Clearance .013″
Exhaust Timing—Open 57½° B.B.C. — **Close** 6½° A.T.C.
Exhaust Clearance .013″

Carburetor Stromberg

Cooling System Centrifugal — **Type** Pump — **Capacity** 22 Qts. 85; 15¼ Qts. 60

Steering Camber 1° — Caster 8° — Toe In $\frac{1}{16}$″

Clutch Plate — **Facings** 60—Woven 6″ x 8½″ x ⅛″ 2 Required
80—5¾″ x 9″ x .137″ 2 Required

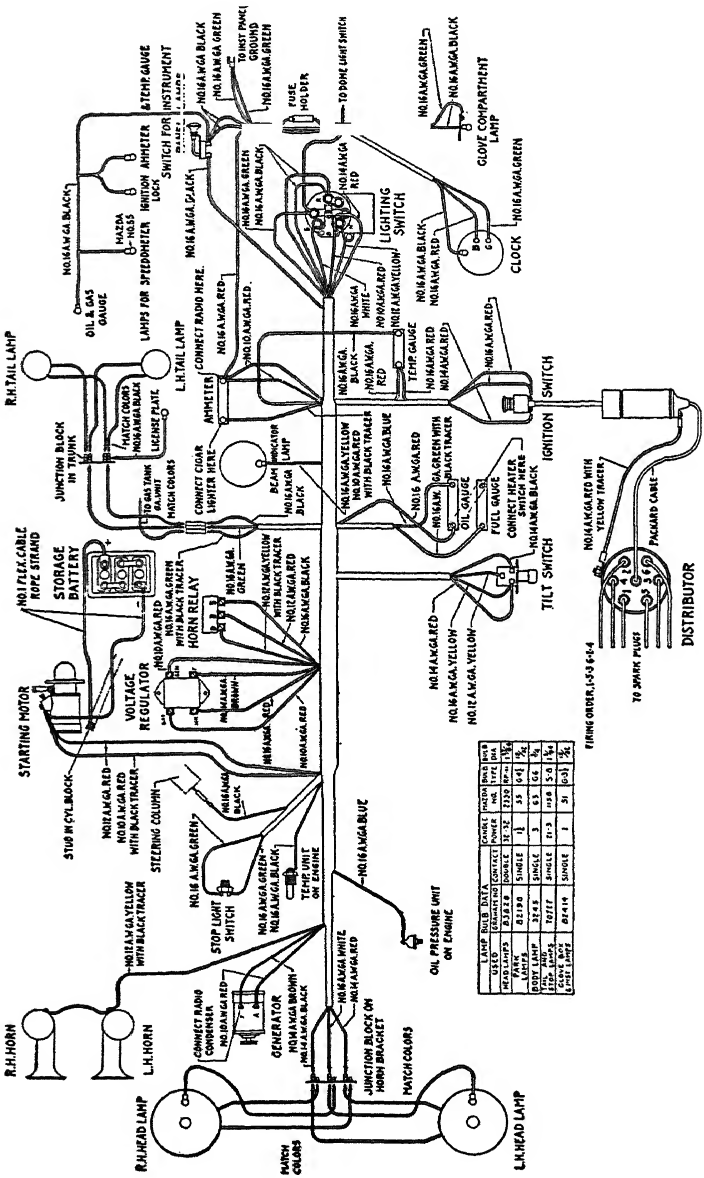
Gear Ratio 60—Ring Gear 40 Pinion 9; 85—34 and 9

Axle ¾ Floating Spiral Gears

Brakes Own Mechanical
- **Front** 26½″ x 1¾″ x $\frac{11}{64}$″ — Clearance .010″
- **Rear** 26½″ x 1¾″ x $\frac{11}{64}$″ — Clearance .010″
- **Hand** 4 Wheels

Lining Woven

Diagram 38-9



GRAHAM WIRING DIAGRAM, 1938, SERIES SUPERCHARGER AND CUSTOM
Courtesy of Graham-Paige Motors Corporation

Graham **Model 6-Cylinder** **Year 1938 Series Supercharger and Custom**

Battery Willard **Type** 15 Plate **Volts** 6 **Amps.** 105
Frame Connection Positive

Lighting Mazda 2330 **Head Lights** 32-32 C.P., 6-8 Volts
Mazda 51 & 55 **Dash, Tail and Stop** 1-3-21 C.P., 6-8 Volts
Mazda 1158 **Side Lights** 1½ C.P., 6-8 Volts

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 28 Amps. **Speed** 3600 R.P.M.
Regulation Voltage **Cut-in** 6.5 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .018″
Spark Plug—Size 14 M.M. Champion **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing Exhaust Close Mark Full Advance

Engine **Bore** 3¼″ **Stroke** 4⅜″ **Taxable H.P.** 25.35
Piston Ring—Width Oil 1—3/16″ Comp. 2—3/32″
Diam. **Gap** .010″
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 4½° B.T.C. **Close** 47½° A.B.C.
Intake Clearance .010″
Exhaust Timing—Open 47½° B.B.C. **Close** 4½° A.T.C.
Exhaust Clearance .010″

Carburetor Marvel

Cooling System Centrifugal **Type** Pump **Capacity** 15½ Qts.

Steering Camber 1° Caster 3° Toe In ⅛″

Clutch Long **Facings** Moulded 6″ x 9½″ x ⅛″ 2 Required

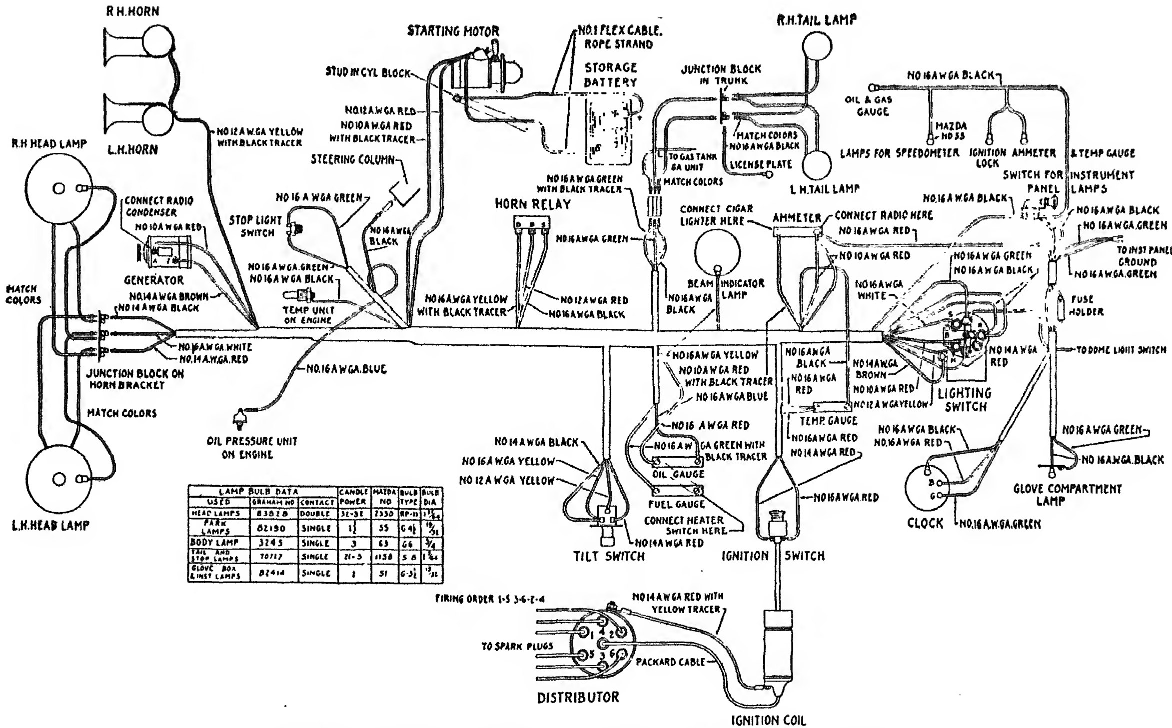
Gear Ratio Ring Gear 47 Pinion 11

Axle Semi-Floating Hypoid Gears

Brakes Lockheed Hydraulic
- **Front** 23″ x 1¾″ x ¼″ Clearance Heel .006″ Toe .010″
- **Rear** 23″ x 1¾″ x ¼″ Clearance Heel .006″ Toe .010″
- **Hand** 17¾″ x 2″ x 5/32″ Transmission Clearance 1/32″

Lining Moulded

Diagram 38-10



LAMP BULB DATA			CANDLE POWER	MAZDA NO	BULB TYPE	BULB DIA
USED	GRAHAM NO	CONTACT				
HEAD LAMPS	83028	DOUBLE	32-32	2330	RP-11	1 11/64
PARK LAMPS	82190	SINGLE	1½	55	G 4½	19/32
BODY LAMP	3245	SINGLE	3	63	G6	3/4
TAIL AND STOP LAMPS	70717	SINGLE	21-3	1158	S 8	1 1/64
GLOVE BOX & INST LAMPS	82414	SINGLE	1	51	G-3½	13/32

GRAHAM WIRING DIAGRAM, 1938, SERIES STANDARD AND SPECIAL

Courtesy of Graham-Paige Motors Corporation

Graham **Model 6-Cylinder** **Year 1938** **Series Standard and Special**

Battery Willard **Type** 15 Plate **Volts** 6 **Amps.** 105
Frame Connection Positive

Lighting Mazda 2330 **Head Lights** 32-32 C.P., 6-8 Volts
Mazda 51 and 55 **Dash, Tail and Stop** 1-3-21 C.P., 6-8 Volts
Mazda 1158 **Side Lights** 1½ C.P., 6-8 Volts

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 18 Amps. **Speed** 2900 R.P.M.
Regulation Voltage **Cut-in** 6.8 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .018″
Spark Plug—Size 14 M.M. Champion **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing Model 96 T.D.C. Full Advanced

Engine **Bore** 3¼″ **Stroke** 4⅜″ **Taxable H.P.** 25.35
Piston Ring—Width Oil 1—1³⁄₁₆″ Comp. 2—³⁄₃₂″
Diam. 3¼″ **Gap** .010″
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 4½° B.T.C. **Close** 47½° A.B.C.
Intake Clearance .010″
Exhaust Timing—Open 47½° B.B.C. **Close** 4½° A.T.C.
Exhaust Clearance .010″

Carburetor Marvel

Cooling System Centrifugal **Type** Pump **Capacity** 15 Qts.

Steering Camber 1° Caster 3° Toe In ⅛″

Clutch Long **Facings** Moulded 6″ x 9½″ x ⅛″ 2 Required

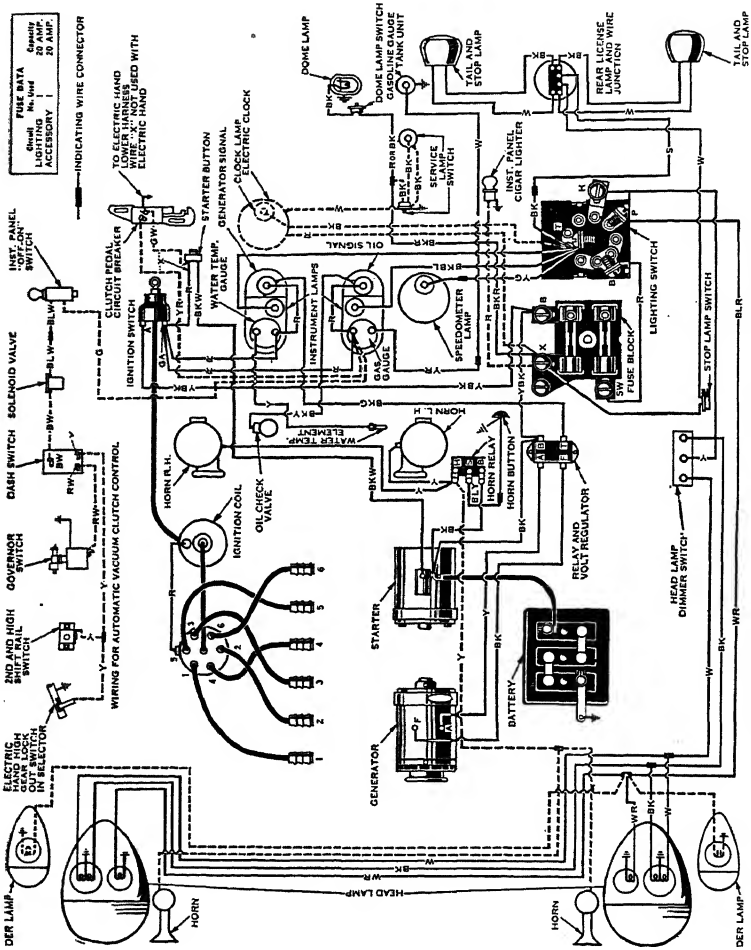
Gear Ratio Ring Gear 47 Pinion 11

Axle Semi-Floating Hypoid Gears

Brakes Lockheed Hydraulic
- **Front** 23″ x 1¾″ x ¼″ Clearance Heel .006″ Toe .010″
- **Rear** 23″ x 1¾″ x ¼″ Clearance Heel .006″ Toe .010″
- **Hand** 17¾″ x 2″ x ⁵⁄₃₂″ Trans. Clearance ¹⁄₃₂″

Lining Moulded

Diagram 38-11



HUDSON WIRING DIAGRAM, 1938, MODEL 6-CYLINDER

Courtesy of Hudson Motor Car Company

Hudson **Model 6-Cylinder** **Year 1938** **Series**

Battery	National	**Type** 17 Plate	**Volts** 6	**Amps.** 105
		Frame Connection	Positive	
Lighting	Mazda 2331	**Head Lights**	32-32 C.P., 6-8 Volts	
	Mazda 55-1158	**Dash, Tail and Stop**	1½-3-21 C.P., 6-8 Volts	
	Mazda 55	**Side Lights**	1½ C.P., 6-8 Volts	

Starter and Generator Auto-Lite

Generator Hot
- **Max. Chg. Rate** 29 Amps. **Speed** 3200 R.P.M.
- **Regulation** 3rd Brush, Voltage **Cut-in** 7 Volts
- **Relay Air Gap** **Contact Gap**

Ignition
- **Contact Breaker Gap** .020″
- **Spark Plug—Size** 14 M.M. Champion **Gap** .032″
- **Firing Order** 1-5-3-6-2-4
- **Timing** T.D.C.

Engine **Bore** 3″ **Stroke** 5″ **Taxable H.P.** 21.6
- **Piston Ring—Width** Oil 2—3/16″ Comp. 2—3/16″
- **Diam.** 3″ **Gap** .009″ to .011″
- **Oiling—Type** Plunger **Capacity** 6 Qts.

Valves
- **Intake Timing—Open** 10½° B.T.C. **Close** 60° A.B.C.
- **Intake Clearance** .006″ Hot
- **Exhaust Timing—Open** 50° B.B.C. **Close** 18¾° A.T.C.
- **Exhaust Clearance** .008″ Hot

Carburetor Carter WDO

Cooling System Centrifugal **Type** Pump **Capacity** 12½ Qts.

Steering Caster 1° to 2° Camber 1° to 1½° Toe In 0″ to ⅛″

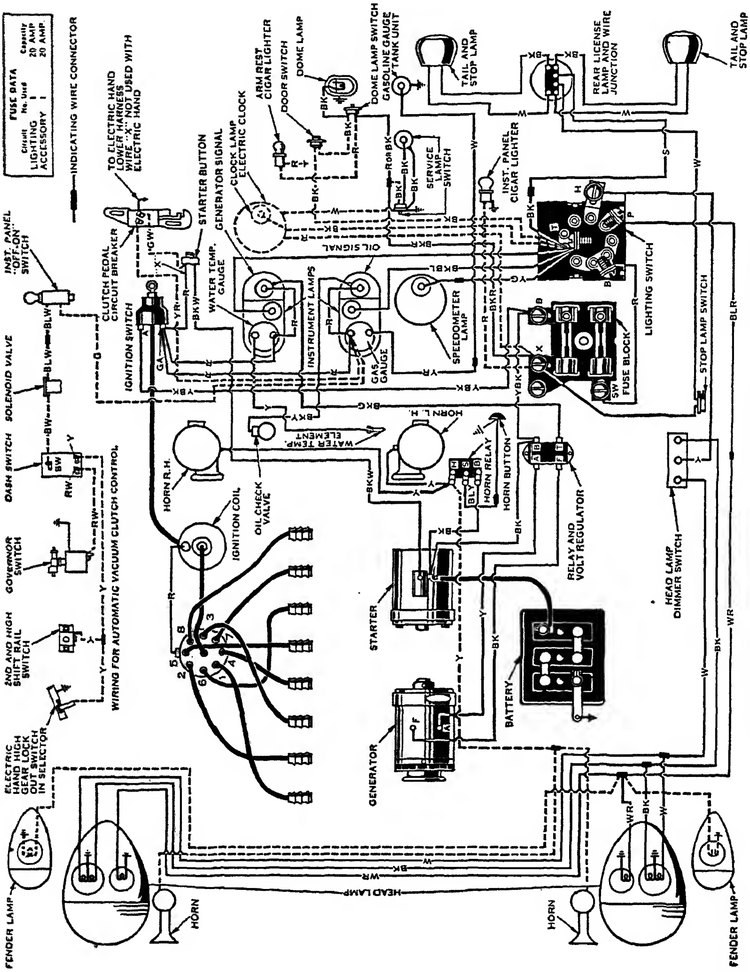
Clutch Wet Plate **Facings** Cork 6⅝″ x 9¾″ x .203″

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gears

Axle Semi-Floating

Brakes Bendix Hydraulic
- **Front** 22⅛″ x 1¾″ x 7/32″ Clearance .010″
- **Rear** 22⅛″ x 1¾″ x 7/32″ Clearance .010″
- **Hand** Rear Service
- **Lining** Moulded

Diagram 38–12



HUDSON WIRING DIAGRAM, 1938, MODEL 8-CYLINDER

Courtesy of Hudson Motor Car Company.

Hudson **Model 8-Cylinder** **Year 1938 Series**

Battery National **Type** 19 Plate **Volts** 6 **Amps.** 125
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 32-32 C.P., 6-8 Volts
Mazda 55-1158 **Dash, Tail and Stop** 1½ C.P., 6-8 Volts
Mazda 55 **Side Lights** 1½ C.P., 6-8 Volts

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 29 Amps. **Speed** 35 M.P.H.
Regulation 3rd Brush, Voltage **Cut-In** 7 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .017″
Spark Plug—Size 14 M.M. Champion **Gap** .032″
Firing Order 1-6-2-5-8-3-7-4
Timing T.D.C.

Engine **Bore** 3″ **Stroke** 4½″ **Taxable H.P.** 28.8
Piston Ring—Width Oil 2—$\frac{3}{16}$″, Comp. 2—$\frac{3}{32}$″
Diam. 3″ **Gap** .009″—.011″
Oiling—Type Plunger **Capacity** 9 Qts.

Valves **Intake Timing—Open** 10½° B.T.C. **Close** 60° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 50° B.T.C. **Close** 18¾° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Carter WDO

Cooling System Centrifugal **Type** Pump **Capacity** 17½ Qts.

Steering Caster 1° to 2°, Camber 1° to 1½° **Toe In** 0″ to ⅛″

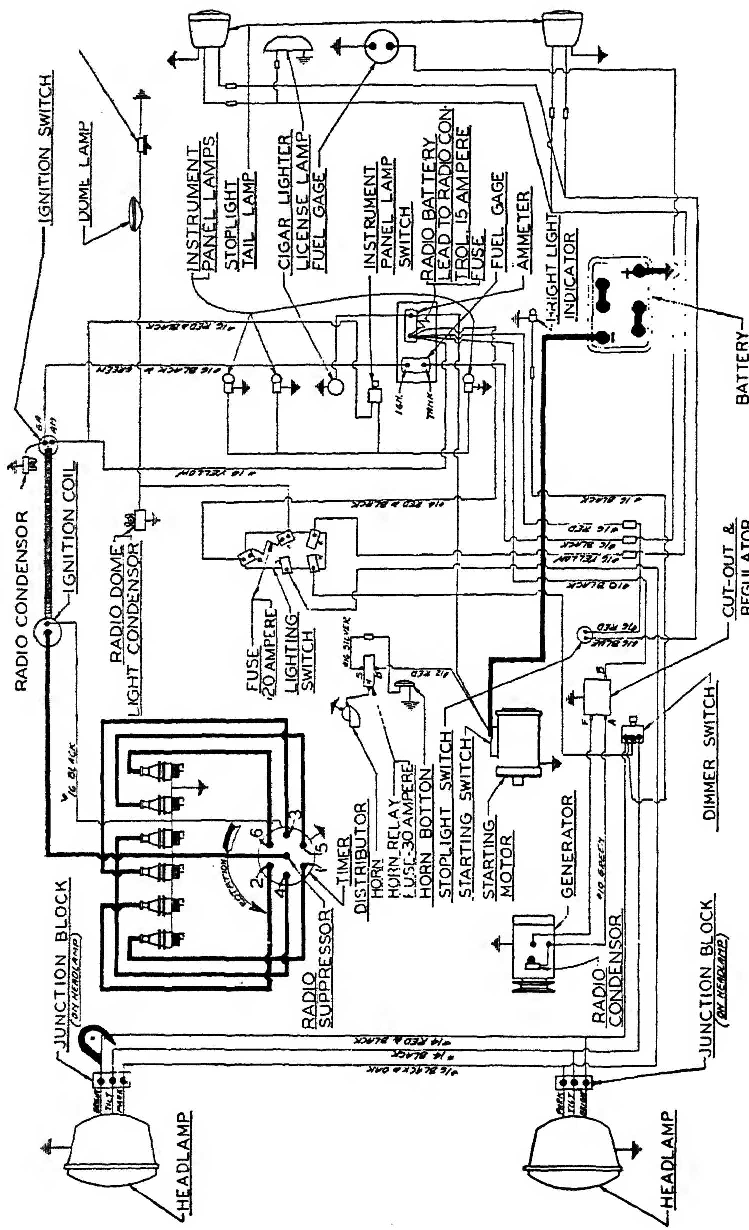
Clutch Wet Plate **Facings** Cork 6⅜″ x 9¾″ x .203″

Gear Ratio Ring Gear 37 Pinion 9 Spiral Gear

Axle Semi-Floating

Brakes Bendix Hydraulic
Front 23$\frac{15}{16}$″ x 1¾″ x $\frac{7}{32}$″ **Clearance** .010″
Rear 23$\frac{15}{16}$″ x 1¾″ x $\frac{7}{32}$″ **Clearance** .010″
Hand Rear Service
Lining Moulded

Diagram 38-13



HUPMOBILE WIRING DIAGRAM, 1938, SERIES E-822
Courtesy of Hupp Motor Car Corporation

Hupmobile **Model 6-Cylinder** **Year 1938** **Series E-822**

Battery Willard **Type** 17 Plate **Volts** 6 **Amps** 120
Frame Connection Positive

Lighting Mazda 2320 **Head Lights** 21-32 C.P., 6-8 Volts, Dble. Con.
Mazda 1158 **Dash, Tail and Stop** 3-21 C.P., 6-8 Volts, Dble. Con.
Mazda 63 **Side Lights** 3 C.P., 6-8 Volts, Dble. Con.

Starter and Generator Auto-Lite

Generator **Max. Chg. Rate** 26.8 Amps. **Speed** 9.5 M.P.H.
Regulation 3rd Brush, Voltage **Cut-In** 6.6 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .022″
Auto-Lite **Spark Plug—Size** 18 M.M. Champion **Gap** .026″-.030″
Firing Order 1-5-3-6-2-4
Timing T.D.C.

Engine **Bore** 3½″ **Stroke** 4¼″ **Taxable H.P.** 29.42
Piston Ring—Width Oil 2—5/32″ Comp, 2—⅛″
Diam. 3½″ **Gap**
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** **Close**
Intake Clearance .010″
Exhaust Timing—Open
Exhaust Clearance .013″

Carburetor

Cooling System **Type** **Capacity** 18 Qts.

Steering Camber 1°, Caster 2° Toe In 1/16″

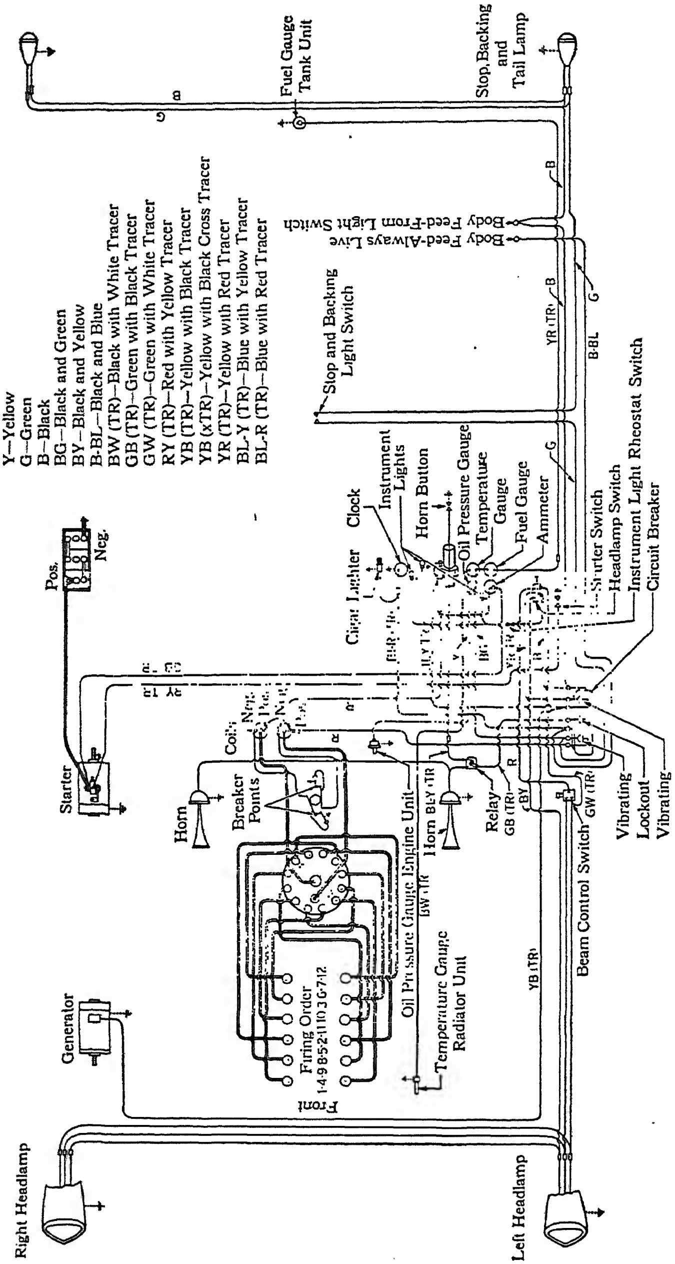
Clutch Borg & Beck **Facings** 2 Moulded and Woven 6⅛″ x 9⅞″ x ⅛″

Gear Ratio Ring Gear 50 Pinion 11

Axle Semi-Floating Hypoid Gears

Brakes Lockheed Hydraulic
Front 20¾″ x 2″ x 3/16″
Rear 20¾″ x 2″ x 3/16″
Hand Rear Service
Lining Moulded

Diagram 38-14

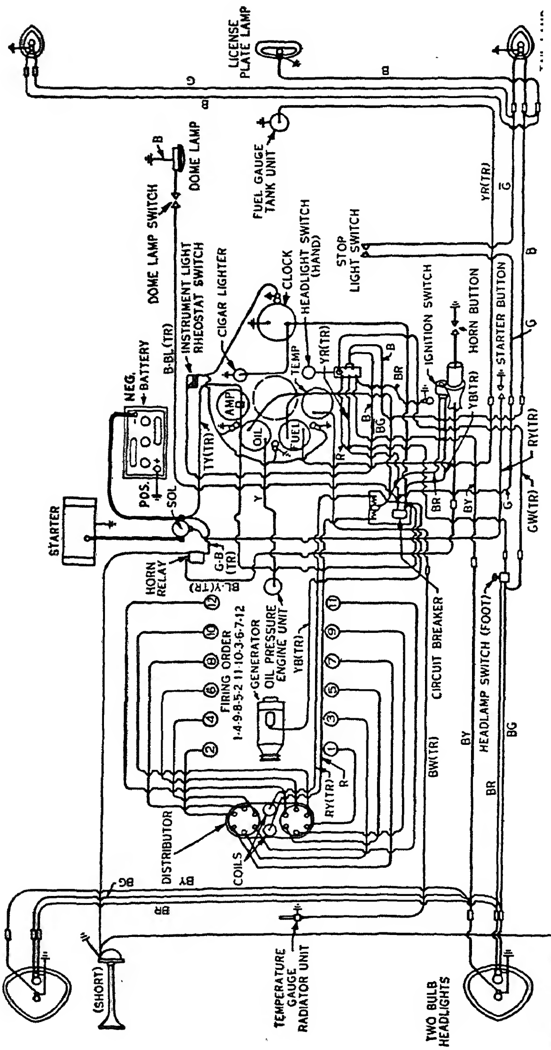


LINCOLN WIRING DIAGRAM, 1938, MODEL V-12-CYLINDER
Courtesy of Ford Motor Company

Lincoln **Model V-12-Cylinder** **Year 1938** **Series**

Battery	Exide	**Type**	**Volts** 6	**Amps.** 147
		Frame Connection	Negative	
Lighting		**Head Lights**	32 C.P., 6-8 Volts	
		Dash, Tail and Stop		
		Side Lights	1½ C.P., 6-8 Volts	
Starter and Generator		Auto-Lite		
Generator	Hot	**Max. Chg. Rate** 18 Amps.	**Speed** 20 M.P.H.	
		Regulation 3rd Brush, Voltage	**Cut-In**	
		Relay Air Gap	**Contact Gap**	
Ignition		**Contact Breaker Gap** .020″		
		Spark Plug—Size 18 M.M. Champion	**Gap** .030″	
		Firing Order 1-4-9-8-5-2-11-10-3-6-7-12		
		Timing T.D.C. Retard		
Engine	**Bore** 3⅛″	**Stroke** 4½″	**Taxable H.P.** 46.8	
	Piston Ring—Width Oil 2—5/32″, Comp. 2—⅛″			
		Diam. 3⅛″	**Gap** Oil .007″, Comp .008″	
	Oiling Type Pump		**Capacity** 12 Qts.	
Valves	**Intake Timing—Open**		**Close**	
	Intake Clearance Zero			
	Exhaust Timing—Open		**Close**	
	Exhaust Clearance Zero			
Carburetor	Stromberg EE			
Cooling System	Centrifugal	**Type** Pump	**Capacity** 8 Gals.	
Steering	Camber 1°, Caster 1½°, Toe In 1/16″			
Clutch	Long	**Facings** Woven 7″ x 12″ x .137″	2 Required	
Gear Ratio	Ring Gear 55	Pinion 12		
Axle	Full-Floating Spiral Gears			
Brakes Bendix Mechanical	**Front** 33½″ x 2½″ x ¼″		**Clearance** .010″	
	Rear 33½″ x 2½″ x ¼″		**Clearance** .010″	
	Hand 4 Wheels			
	Lining Moulded			

Diagram 38-15



B=BLACK
G=GREEN
R=RED
Y=YELLOW
BG=BLACK AND GREEN
BR=BLACK AND RED
BY=BLACK AND YELLOW
G-B(TR)=GREEN WITH BLACK TRACER
GW(TR)=GREEN WITH WHITE TRACER

BW(TR)=BLACK WITH WHITE TRACER
RY(TR)=RED WITH YELLOW TRACER
BL-Y(TR)=BLUE WITH YELLOW TRACER
BL-R(TR)=BLUE WITH RED TRACER
YB(TR)=YELLOW WITH BLACK TRACER
B-BL=BLACK AND BLUE
YR(TR)=YELLOW WITH RED TRACER
TR(TR)=TAN WITH YELLOW TRACER

LINCOLN-ZEPHYR WIRING DIAGRAM, 1938, MODEL 12-CYLINDER
Courtesy of Ford Motor Company

Lincoln-Zephyr **Model 12-Cylinder** **Year 1938 Series**

Battery Own **Type** **Volts** 6 **Amps.** 100
Frame Connection Positive

Lighting **Head Lights** 6-8 Volts
Dash, Tail and Stop 6-8 Volts
Side Lights 6-8 Volts

Starter and Generator Own

Generator Hot **Max. Chg. Rate** 26 Amps. **Speed** 30 M.P.H.
Regulation Voltage and Current **Cut-In** 7 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .014″-.016″
Spark Plug—Size 18 M.M. Champion **Gap** .028″-.030″
Firing Order 1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R
Timing

Engine **Bore** 2¾″ **Stroke** 3¾″ **Taxable H.P.** 36.39
Piston Ring—Width Oil 1—5/32″; Comp. 2—3/32″
Diam. 2¾″ **Gap** .008″
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 19½° B.T.C. **Close** 54½° A.B.C.
Intake Clearance .000″
Exhaust Timing—Open 57½° B.B.C. **Close** 16½° A.T.C.
Exhaust Clearance .000″

Carburetor Chandler Groves

Cooling System Centrifugal **Type** Pump **Capacity** 30 Qts.

Steering Camber ¾°, Caster 4°, Toe In 1/16″

Clutch Long **Facings** Woven 6″ x 10″ x .137″ 2 Required

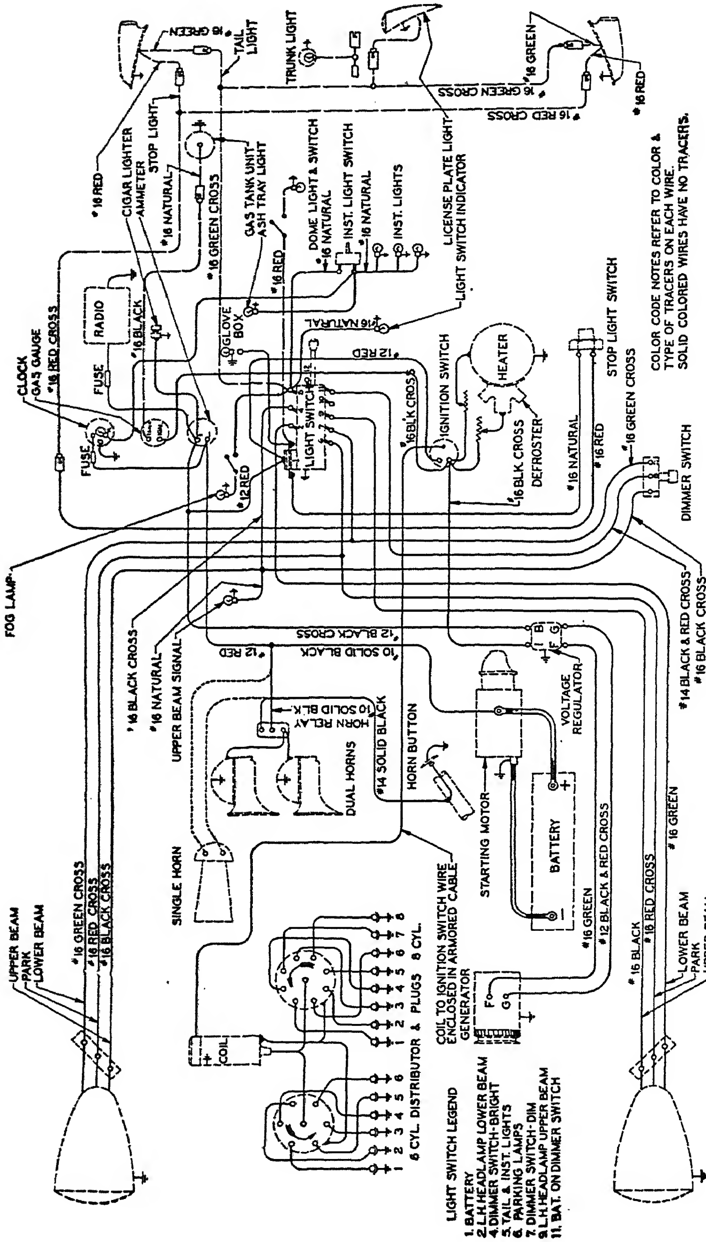
Gear Ratio Ring Gear 39 Pinion 9

Axle ¾″ Floating Hypoid Gears

Brakes Bendix Mechanical
- **Front** 23⅞″ x 1¾″ x 7/32″ **Clearance** .010″
- **Rear** 23⅞″ x 1¾″ x 7/32″ **Clearance** .010″
- **Hand** 4 Wheels

Lining Moulded

Diagram 38-16



OLDSMOBILE WIRING DIAGRAM, 1938, SERIES F AND L-37

Courtesy of Olds Motor Works

Oldsmobile Model 6- and 8-Cylinders Year 1938 Series F and L-37

Battery Delco **Type** 6 Cyl. 15E1-W, 8-17 E1-W **Volts** 6 **Amps.** 6-94, 8-110
Frame Connection Negative

Lighting 2320L **Head Lights** 21-32 C.P., 6-8 Volts
1154 **Dash, Tail and Stop** 21-3 C.P., 6-8 Volts
55 **Side Lights** 1½ C.P., 6-8 Volts

Starter and Generator Delco-Remy

Generator Cold **Max. Chg. Rate** 26-30 Amps. **Speed** 30-35 M.P.H.
Regulation 3rd Brush, Voltage **Cut-In** 6.5-7.0 Volts
Relay Air Gap .016″-.020″ **Contact Gap** .016″-.022″

Ignition Delco **Contact Breaker Gap** F-38-.020″ L-38-.015″
Spark Plug—Size 14 M.M. AC **Gap** F-38-.040″
L-38-.030″
Firing Order 6, 1-5-3-6-2-4; 8, 1-6-2-5-8-3-7-4
Timing T.D.C. on F, 2° B.T.C. on L

Engine **Bore** F-3 7/16″, L-3¼″ **Stroke** F-4⅛″, L-3⅞″ **Tax. H.P.** F-28.4, L-33.8
Piston Ring—Width F Oil 2—3/16″, L 2 3/16″; Comp. F 2—⅛″, L 2—3/32″
Diam. F 3 7/16″, L-3¼″ **Gap** F and L, .009-.014 on Oil and Comp.
Oiling—Type Pump **Capacity** F-6 Qts., L-7 Qts.

Valves **Intake Tim.–Op.** F 5° B.T.C., L T.D.C. **Close** F 45° A.B.C., L 35° A.B.C.
Intake Clearance .008″ Warm on Both Models
Exhaust Tim.—Op. 45° B.B.C. on Both **Close** F 5° A.T.C., L 10° A.T.C.
Exhaust Clearance .011″ Warm on Both Models

Carburetor Carter 385-S

Cooling System Centrifugal **Type** Pump **Capacity** F 17 Qts., L 21 Qts.

Steering Camber 1/32″, Caster 5/64″, Toe In ⅛″

Clutch Plate **Facings** F 5⅝″x9¼″x⅛″, L 6″x10″x⅛″ 2 Required

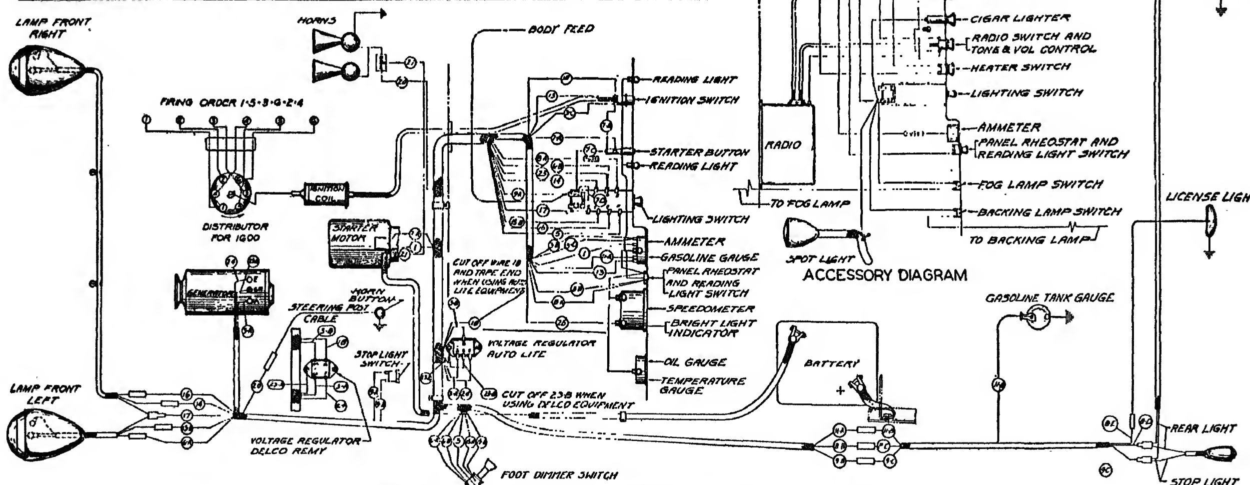
Gear Ratio Ring Gear 35 Pinion 8, on Both Models

Axle Semi-Floating Hypoid Gears

Brakes Bendix Hydraulic
Front Primary F 9 11/32″x1¾″x3/16″, L 10 3/32″x1¾″x3/16″ **Cl.** .010″
Rear Secondary F 11 31/32″x1¾″x3/16″, L 12 61/64″x1¾″x3/16″
Hand Rear Service
Lining Primary Moulded, Secondary Woven and Compressed

Diagram 38-17

NO	GA	COLOR	LOCATION	NO	GA	COLOR	LOCATION
1	10	RED	FROM STARTER MOTOR SWITCH TO AMMETER	13	16	BLACK	FROM IGNITION SWITCH TO GASOLINE GAUGE
3A	10	RED	FROM CURRENT REGULATOR TO GENERATOR	14	14	RED	FROM LIGHTING SW. TO LAMP FRONT RT. (CITY)
3B	10	BLACK	FROM CURRENT REGULATOR TO AMMETER	15A	14	WHITE	FROM DIMMER SW. TO LAMP FRONT LT. ([illegible])
3C	12	BLACK	FROM IGNITION SWITCH TO AMMETER	15B	14	WHITE	FROM DIMMER SWITCH TO LIGHTING SWITCH
5	14	BLACK	FROM LIGHTING SWITCH TO DIMMER SWITCH	16	14	GREEN	FROM LIGHTING SW. TO LAMP FRONT RT. ([illegible])
6A	14	YELLOW	FROM DIMMER SWITCH TO LAMP F'T. L'T ([illegible])	17	16	BLACK WITH RED TRAC.	FROM LIGHT'G. SW. TO LAMP F'T. R'T. & L'T. (PARKING)
6B	14	YELLOW	FROM DIMMER SWITCH TO LIGHTING SWITCH	18	14	YELLOW	FROM IGNITION SW. TO CURRENT REGUL'R. ([illegible])
7A	16	BLACK	FROM STARTER BUTT. TO STARTER MOT. SW.	20	16	BLACK	FROM STEERING POST HORN BUTT. TO HORN REL.
7B	12	BLACK	FROM STARTER BUTT. TO IGNITION SWITCH	21	12	BLACK	FROM STARTER MOTOR SW. TO HORN RELAY.
7C	12	BLACK	FROM STARTER BUTT. TO LIGHTING SWITCH	[illegible]	14	GREEN	FROM VOLTAGE REGULATOR TO GENERATOR.
8A	16	BLACK	FROM PANEL RHEOSTAT TO FUSE TO LIGHT. SW.	24	18	BROWN	FROM VOLTAGE REGULATOR TO GENERATOR.
8B	16	BLACK	FROM PANEL RHEOSTAT TO R'R. HARNESS J'N	25	18	WHITE	FROM LIGHTING SW. TO SPEEDOM. BRIGHT LIGHT IND.
8C	16	BLACK	FROM R'R. HARNESS J'N. TO REAR LAMPS				
9A	16	GREEN	FROM FUSE AT LIGHT'G. SW. TO STOP LIGHT SW.				
9B	16	GREEN	FROM R'R. HARNESS J'N TO STOP LIGHT SW.				
9C	16	GREEN	FROM R'R. HARNESS J'N. TO STOP LIGHT.				
11A	18	TAN WITH RED AND BLACK TRACER	FROM R'R. HARNESS J'N TO GAS. GAUGE.				
11B	18	TAN WITH RED AND BLACK TRACER	FROM R'R HARNESS J'N. TO GAS. TANK GAUGE				



PACKARD WIRING DIAGRAM, 1938, MODEL 6-CYLINDER

Courtesy of Packard Motor Car Company

Packard Model 6-Cylinder Year 1938 Series

Battery Willard **Type** **Volts** 6 **Amps.** 95
Frame Connection Positive

Lighting **Head Lights** 6-8 Volts
Dash, Tail and Stop 6-8 Volts
Side Lights 6-8 Volts

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 26.5 **Speed** 3400 R.P.M.
Regulation Voltage **Cut-In** 6.5
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 10 M.M. AC **Gap** .028″
Firing Order 1-5-3-6-2-4
Timing 4½°-6° B.T.C.

Engine **Bore** 3½″ **Stroke** 4¼″ **Taxable H.P.** 29.4
Piston Ring—Width Oil 1—$\frac{3}{16}$″; Comp. 2—⅛″
Diam. 3½″ **Gap** .007″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 1° B.T.C. **Close** 39° A.B.C.
Intake Clearance .007″ Warm
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .010″ Warm

Carburetor Chandler Groves

Cooling System Centrifugal **Type** Pump **Capacity** 15 Qts.

Steering Camber ½°, Caster 1½°, Toe In $\frac{1}{32}$″

Clutch Long **Facings** Woven 6″ x 9½″ x ⅛″ 2 Required

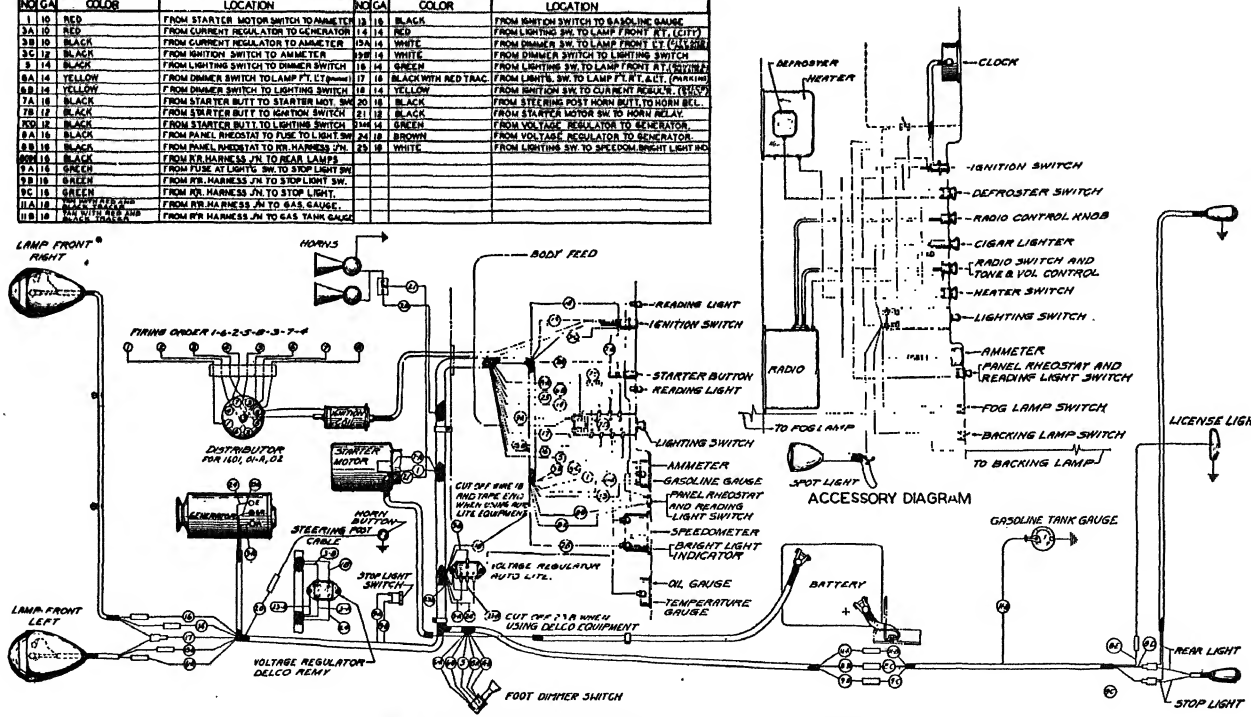
Gear Ratio 4.54-1

Axle Semi-Floating Hypoid Gears

Brakes Bendix Hydraulic
Front 24″ x 1¾″ x $\frac{3}{16}$″
Rear 24″ x 1¾″ x $\frac{3}{16}$″
Hand Rear Service
Lining

Diagram 38-18

NO	GA	COLOR	LOCATION	NO	GA	COLOR	LOCATION
1	10	RED	FROM STARTER MOTOR SWITCH TO AMMETER	13	16	BLACK	FROM IGNITION SWITCH TO GASOLINE GAUGE
3A	10	RED	FROM CURRENT REGULATOR TO GENERATOR	14	14	RED	FROM LIGHTING SW. TO LAMP FRONT RT. (CITY)
3B	10	BLACK	FROM CURRENT REGULATOR TO AMMETER	15A	14	WHITE	FROM DIMMER SW. TO LAMP FRONT LT. [illegible]
3C	12	BLACK	FROM IGNITION SWITCH TO AMMETER	15B	14	WHITE	FROM DIMMER SWITCH TO LIGHTING SWITCH
5	14	BLACK	FROM LIGHTING SWITCH TO DIMMER SWITCH	16	14	GREEN	FROM LIGHTING SW. TO LAMP FRONT RT. [illegible]
6A	14	YELLOW	FROM DIMMER SWITCH TO LAMP FT. LT. [illegible]	17	16	BLACK WITH RED TRAC.	FROM LIGHTG. SW. TO LAMP FT. RT. & LT. (PARKING)
6B	14	YELLOW	FROM DIMMER SWITCH TO LIGHTING SWITCH	18	14	YELLOW	FROM IGNITION SW. TO CURRENT REGUL'R. [illegible]
7A	16	BLACK	FROM STARTER BUTT TO STARTER MOT. SW.	20	16	BLACK	FROM STEERING POST HORN BUTT. TO HORN REL.
7B	12	BLACK	FROM STARTER BUTT TO IGNITION SWITCH	21	12	BLACK	FROM STARTER MOTOR SW. TO HORN RELAY.
7C	12	BLACK	FROM STARTER BUTT. TO LIGHTING SWITCH	[illegible]	14	GREEN	FROM VOLTAGE REGULATOR TO GENERATOR.
8A	16	BLACK	FROM PANEL RHEOSTAT TO FUSE TO LIGHT. SW.	24	18	BROWN	FROM VOLTAGE REGULATOR TO GENERATOR.
8B	16	BLACK	FROM PANEL RHEOSTAT TO RR. HARNESS J'N.	25	18	WHITE	FROM LIGHTING SW. TO SPEEDOM. BRIGHT LIGHT IND.
[illegible]	16	BLACK	FROM R'R. HARNESS J'N. TO REAR LAMPS				
9A	16	GREEN	FROM FUSE AT LIGHTG. SW. TO STOP LIGHT SW.				
9B	16	GREEN	FROM R'R. HARNESS J'N TO STOP LIGHT SW.				
9C	18	GREEN	FROM R'R. HARNESS J'N. TO STOP LIGHT.				
11A	18	TAN WITH RED AND BLACK TRACER	FROM R'R. HARNESS J'N TO GAS. GAUGE.				
11B	18	TAN WITH RED AND BLACK TRACER	FROM R'R HARNESS J'N TO GAS TANK GAUGE				



PACKARD WIRING DIAGRAM, 1938, MODEL 8-CYLINDER

Courtesy of Packard Motor Car Company

Packard Model 8-Cylinder Year 1938 Series

Battery Delco-Remy **Type** **Volts** 6 **Amps.** 114
Frame Connection Positive

Lighting **Head Lights** 6-8 Volts
Dash, Tail and Stop 6-8 Volts
Side Lights 6-8 Volts

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 25.5 Amps. **Speed** 2500 R. P. M.
Regulation Voltage **Cut-In** 7 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .015″
Spark Plug—Size 10 M.M. AC **Gap** .028″
Firing Order 1-6-2-5-8-3-7-4
Timing 6°-8° B.T.C.

Engine **Bore** 3¼″ **Stroke** 4¼″ **Taxable H.P.** 33.8
Piston Ring—Width Oil 1—3/16″; Comp. 2—⅛″
Diam. 3¼″ **Gap** .007″
Oiling—Type Pump **Capacity** 6 Qts.

Valves **Intake Timing—Open** 1° B.T.C. **Close** 39° A.B.C.
Intake Clearance .007″ Warm
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .010″ Warm

Carburetor Stromberg

Cooling System Centrifugal **Type** Pump **Capacity** 16 Qts.

Steering Camber ½°, Caster 1½°, Toe In 1/32″

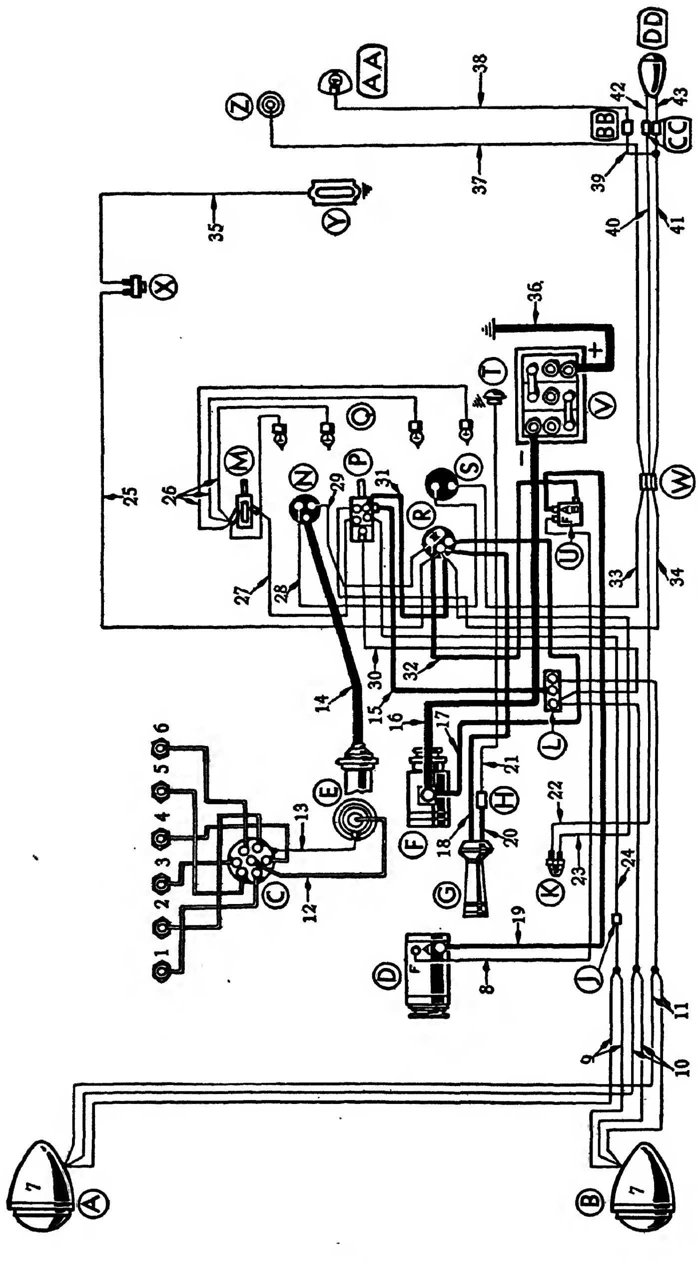
Clutch Long **Facings** Woven 6″ x 10″ x .137″ 2 Required

Gear Ratio 4.36-1

Axle Semi-Floating Hypoid Gears

Brakes Bendix Hydraulic
Front 26″ x 1¾″ x 3/16″
Rear 26″ x 1¾″ x 3/16″
Hand Rear Service
Lining

Diagram 38-19



PLYMOUTH WIRING DIAGRAM, 1938, MODEL 6-CYLINDER
Courtesy of Chrysler Corporation

Plymouth Model 6-Cylinder Year 1938 Series

Battery Willard **Type** **Volts** 6 **Amps.** 90
Frame Connection Positive

Lighting Mazda 2331 **Head Lights** 32-32 C.P., 6-8 Volts
Mazda 55-1158 **Dash, Tail and Stop** 1½-3-21 C.P., 6-8 Volts
Mazda 55 **Side Lights** 1½ C.P., 6-8 Volts

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 26-29 Amps. **Speed** 30 M.P.H.
Regulation 3rd Brush, Voltage **Cut-In** 7.1-7.7 Volts
Relay Air Gap **Contact Gap** .015″-.025″

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 14 M.M. **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 4° A.T.C.

Engine **Bore** 3⅛″ **Stroke** 4⅜″ **Taxable H.P.** 23.44
Piston Ring—Width Oil 2—5/32″; Comp. 2—⅛″
Diam. 3⅛″ **Gap** .007″-.015″
Oiling—Type Pump **Capacity** 5 Qts.

Valves **Intake Timing—Open** 6° A.T.C. **Close** 46° A.B.C.
Intake Clearance .006″ Hot
Exhaust Timing—Open 42° B.B.C. **Close** 8° A.T.C.
Exhaust Clearance .008″ Hot

Carburetor Carter

Cooling System Centrifugal **Type** Pump **Capacity** 3½ Gallons

Steering Caster 3°-5°, Camber ¼°-¾°, Toe In 1/16″

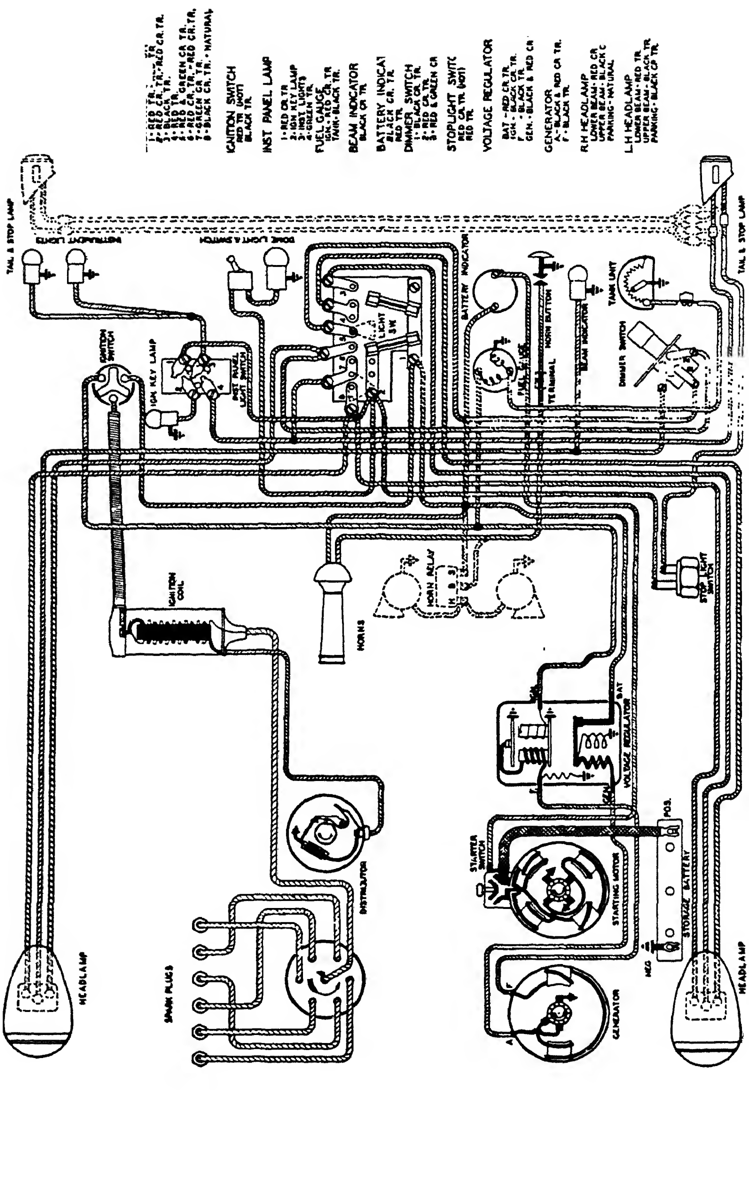
Clutch Borg & Beck **Facings** Woven 5⅝″ x 9¼″ x .133″ 2 Required

Gear Ratio Ring Gear 39 Pinion 10 Hypoid Gears

Axle Semi-Floating

Brakes Lockheed Hydraulic
Front 17 19/64″ x 2″ x 13/64″ Clearance Heel .006″; Toe .012″
Rear 17 19/64″ x 2″ x 13/64″ Clearance Heel .006″; Toe .012″
Hand 17 1/16″ x 2″ x 5/32″ Transmission Clearance .025″
Lining Moulded

Diagram 38-20



PONTIAC WIRING DIAGRAM, 1938, MODEL 6-CYLINDER

Courtesy of Pontiac Motor Company

Pontiac **Model 6-Cylinder** **Year 1938** **Series**

Battery Delco **Type** 15-E-1W **Volts** 6 **Amps.**
Frame Connection Negative

Lighting 2320L **Head Lights** 6-8 Volts
87 and 55 **Dash, Tail and Stop** 6-8 Volts
55 **Side Lights** 6-8 Volts

Starter and Generator Delco-Remy

Generator Cold **Max. Chg. Rate** 26.4-30.4 Amps. **Speed** 3250 R.P.M.
Regulation 3rd Brush, Voltage **Cut-In** 6.5 Volts
Relay Air Gap .18″-.025″ **Contact Gap** .18″-.025″

Ignition **Contact Breaker Gap** .020″
Delco-Remy **Spark Plug—Size** 14 M.M. AC **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 4° B.T.C. Retard

Engine **Bore** 3 7/16″ **Stroke** 4″ **Taxable H.P.** 28.3
Piston Ring—Width Oil, 1—3/16″; Comp. 2—1/8″
Diam. 3 7/16″ **Gap** .007″-.017″
Oiling—Type Pressure **Capacity** 6 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance .011″-.013″ Hot
Exhaust Timing—Open 45° B.B.C. **Close** 5° B.T.C.
Exhaust Clearance .011″-.013″ Hot

Carburetor Carter W1 1 1/4″

Cooling System Centrifugal **Type** Pump **Capacity** 16 Qts.

Steering Caster 3/4°, Camber 3/4°, Toe In 0″

Clutch Plate **Facings** 2 Moulded 10″ x 6″ x 1/8″

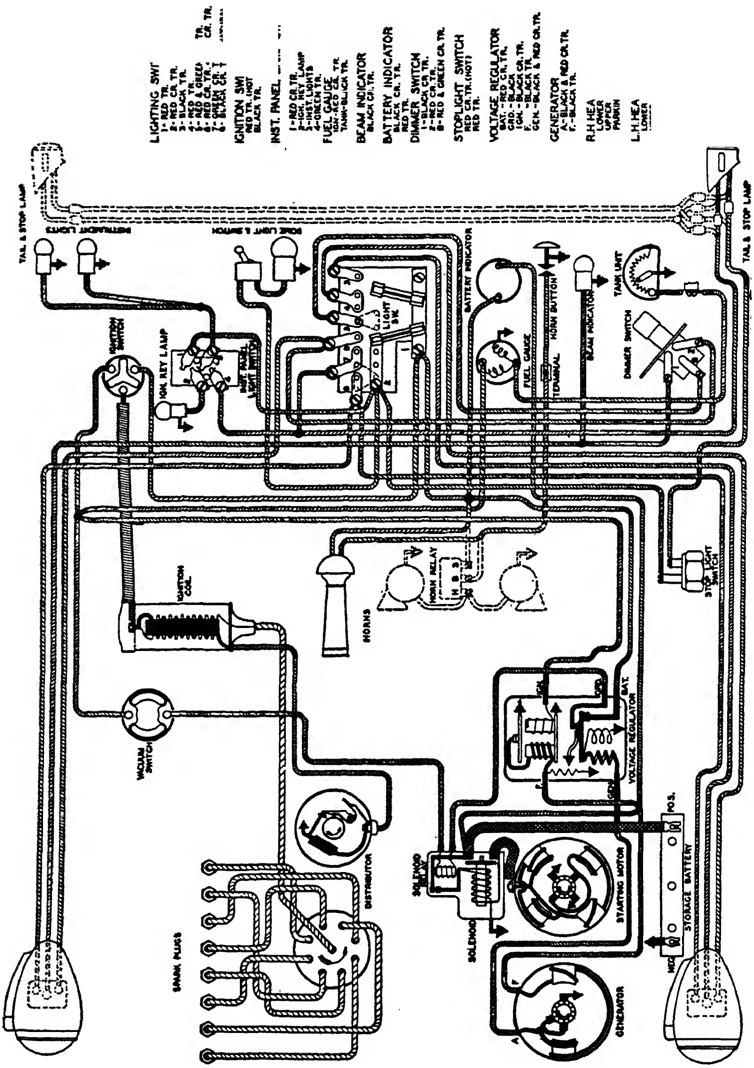
Gear Ratio Ring Gear 35 Pinion 8

Axle Semi-Floating Spiral Gears

Brakes Bendix Hydraulic
Front 23 1/16″ x 1 3/4″ x 3/16″ Clearance .010″
Rear 23 1/16″ x 1 3/4″ x 3/16″ Clearance .010″
Hand As Above Rear Service

Lining Moulded

Diagram 38-21



PONTIAC WIRING DIAGRAM, 1938, MODEL 8-CYLINDER
Courtesy of Pontiac Motor Company

Pontiac **Model** 8-Cylinder **Year** 1938 **Series**

Battery	Delco	**Type** 17-E-1W	**Volts** 6	**Amps.** 112
		Frame Connection	Negative	
Lighting	2320L	**Head Lights**	6-8 Volts	
	87L and 55	**Dash, Tail and Stop**	6-8 Volts	
	55	**Side Lights**	6-8 Volts	

Starter and Generator Delco-Remy

Generator Cold — **Max. Chg. Rate** 26.4-30.4 Amps. — **Speed** 3250 R.P.M.
Regulation 3rd Brush, Voltage — **Cut-In** 6.5 Volts
Relay Air Gap .18″ to .025″ — **Contact Gap** .18″-.025″

Ignition — **Contact Breaker Gap** .015″
Delco-Remy — **Spark Plug—Size** 14 M.M. AC — **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing 4° B.T.C. Retard

Engine **Bore** 3¼″ **Stroke** 3¾″ **Taxable H.P.** 33.8
Piston Ring—Width Oil, 1—$\frac{3}{16}$″; Comp. 2—⅛″
Diam. 3¼″ **Gap** .007″-.017″
Oiling—Type Pump **Capacity** 7 Qts.

Valves **Intake Timing—Open** 5° B.T.C. **Close** 39° A.B.C.
Intake Clearance .011″-.013″ Hot
Exhaust Timing—Open 45° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .011″-.013″ Hot

Carburetor Carter W1-1$\frac{5}{16}$

Cooling System Centrifugal **Type** Pump **Capacity** 19 Qts.

Steering Caster ¾°, Camber ¾°, Toe In 0″

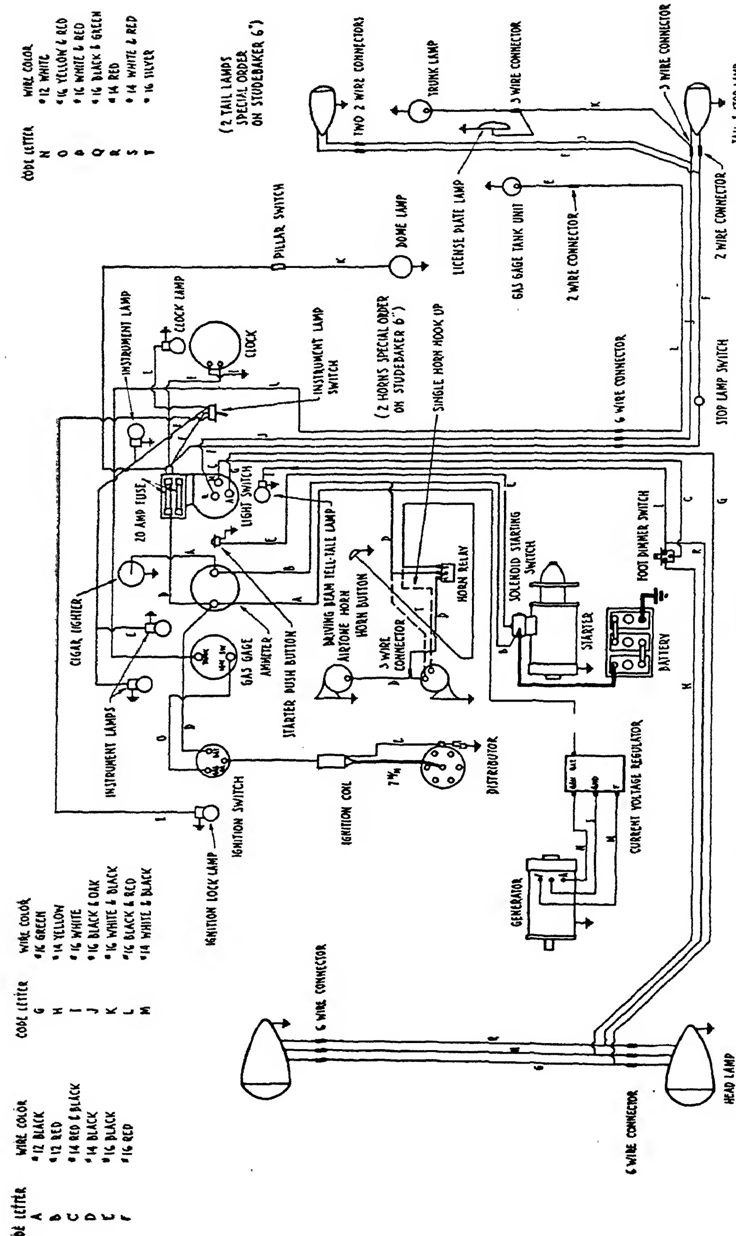
Clutch Plate **Facings** 2 Moulded 10″ x 6″ x ⅛″

Gear Ratio Ring Gear 35 Pinion 8 Spiral Gears

Axle Semi-Floating

Brakes Bendix Hydraulic
Front 23$\frac{1}{16}$″ x 1¾″ x $\frac{3}{16}$″ **Clearance** .010″
Rear 23$\frac{1}{16}$″ x 1¾″ x $\frac{3}{16}$″ **Clearance** .010″
Hand As Above Rear Service
Lining Moulded

Diagram 38-22



STUDEBAKER WIRING DIAGRAM, 1938, MODEL COMMANDER
Courtesy of Studebaker Corporation

Studebaker Model Commander Year 1938 Series

Battery	Willard	**Type** WHT-2-105	**Volts** 6	105
		Frame Connection	Positive	
Lighting	Mazda 2331	**Head Lights**	32-32 C.P., 6-8 Volts	
	Mazda 55-1158	**Dash, Tail and Stop**	1½-2-21 C.P., 6-8 Volts	
	Mazda 55	**Side Lights**	1½ C.P., 6-8 Volts	

Starter and Generator Auto-Lite

Generator Hot **Max. Chg. Rate** 22 Amps. **Speed** 2500 R.P.M.
Regulation 3rd Brush, Voltage **Cut-In** 6.4 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 18 M.M. Champion **Gap** .025″
Firing Order 1-5-3-6-2-4
Timing 9/64″ B.T.C.

Engine **Bore** 3 5/16″ **Stroke** 4 3/8″ **Taxable H.P.** 26.35
Piston Ring—Width Oil 1—3/16″; Comp. 2—1/8″
Diam. 3 5/16″ **Gap** Oil .013″-.018″; Comp. .013″-.018″
Oiling—Type Pump **Capacity** 5½ Qts.

Valves **Intake Timing—Open** 15° B.T.C. **Close** 49° A.B.C.
Intake Clearance .016″ Cold
Exhaust Timing—Open 54° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .016″ Cold

Carburetor Stromberg BXO26

Cooling System Centrifugal **Type** Pump **Capacity** 14 Qts.

Steering Caster ¼°-¾°, Camber ¼°-¾°, Toe In 1/16″-1/8″

Clutch Borg & Beck **Facings** Composition 5⅝″ x 9¼″ x .137″ 2 Required

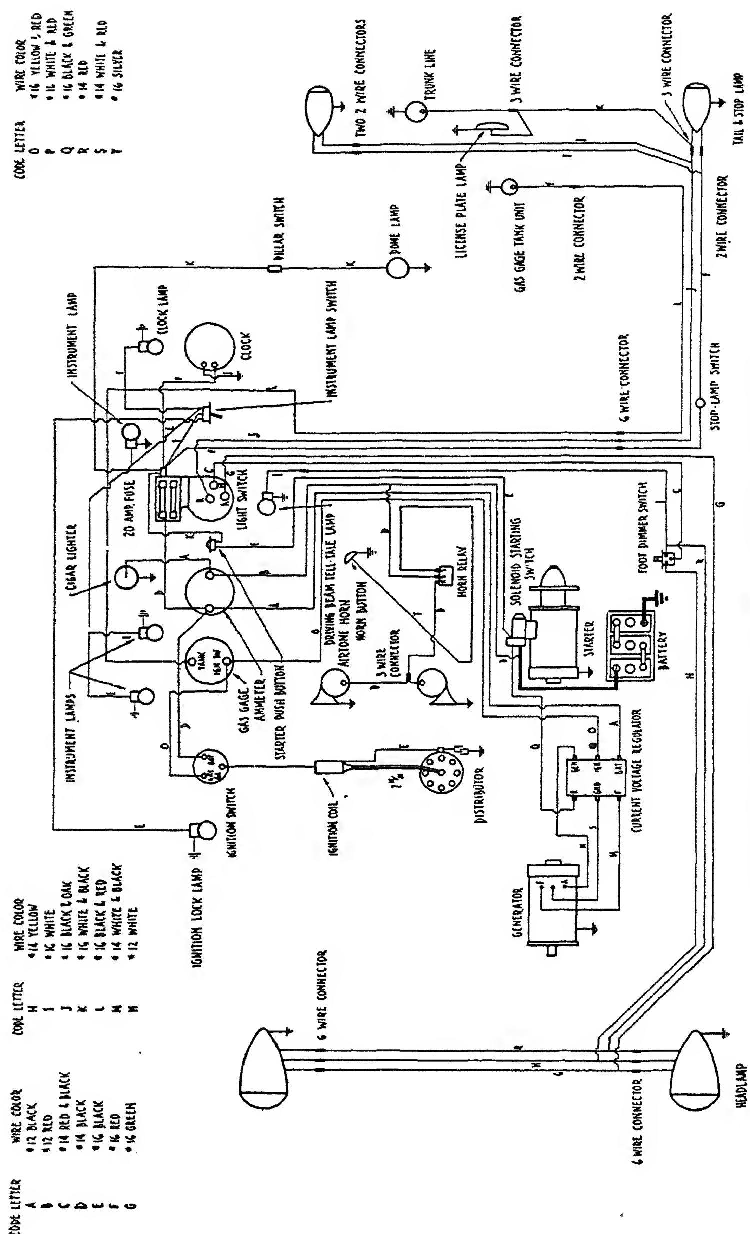
Gear Ratio 4.55-1 Hypoid Gears

Axle Semi-Floating

Brakes Lockheed Hydraulic
- **Front** 19 11/16″ x 2″ x 5/16″ Clearance Anchor .005″ Piston .010″
- **Rear** 19 11/16″ x 2″ x 5/16″ Clearance Anchor .005″ Piston .010″
- **Hand** Rear Service

Lining Moulded

Diagram 38-23



STUDEBAKER WIRING DIAGRAM, 1938, MODEL PRESIDENT
Courtesy of Studebaker Corporation

Studebaker Model President **Year 1938 Series**

Battery	Willard	**Type** WHT-2-105	**Volts** 6	105
		Frame Connection	Positive	
Lighting	Mazda 2331	**Head Lights**	32-32 C.P., 6-8 Volts	
	Mazda 55-1158	**Dash, Tail and Stop**	1½-2-21 C.P., 6-8 Volts	
	Mazda 55	**Side Lights**	1½ C.P., 6-8 Volts	

Starter and Generator Delco-Remy

Generator Hot **Max. Chg. Rate** 26 Amps. **Speed** 1750 R.P.M.
Regulation 3rd Brush, Voltage **Cut-In** 6.4 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .018″-.024″
Spark Plug—Size 18 M.M. Champion **Gap** .025″
Firing Order 1-6-2-5-8-3-7-4
Timing T.D.C.

Engine **Bore** 3$\frac{1}{16}$″ **Stroke** 4¼″ **Taxable H.P.** 30
Piston Ring—Width Oil 1—$\frac{3}{16}$″; Comp. 2—⅛″
Diam. 3$\frac{1}{16}$″ **Gap** Oil .013″-.018″; Comp. .013″-.018″
Oiling—Type Pump **Capacity** 8 Qts.

Valves **Intake Timing—Open** 15° B.T.C. **Close** 49° A.B.C.
Intake Clearance .016″ Cold
Exhaust Timing—Open 54° B.B.C. **Close** 10° A.T.C.
Exhaust Clearance .016″ Cold

Carburetor Stromberg AA016

Cooling System Centrifugal **Type** Pump **Capacity** 17 Qts.

Steering Caster ¼°-¾°, Camber ¼°-¾°, Toe In $\frac{1}{16}$″-⅛″

Clutch Long **Facings** Composition 6″ x 9.5″ x .125″ 2 Required

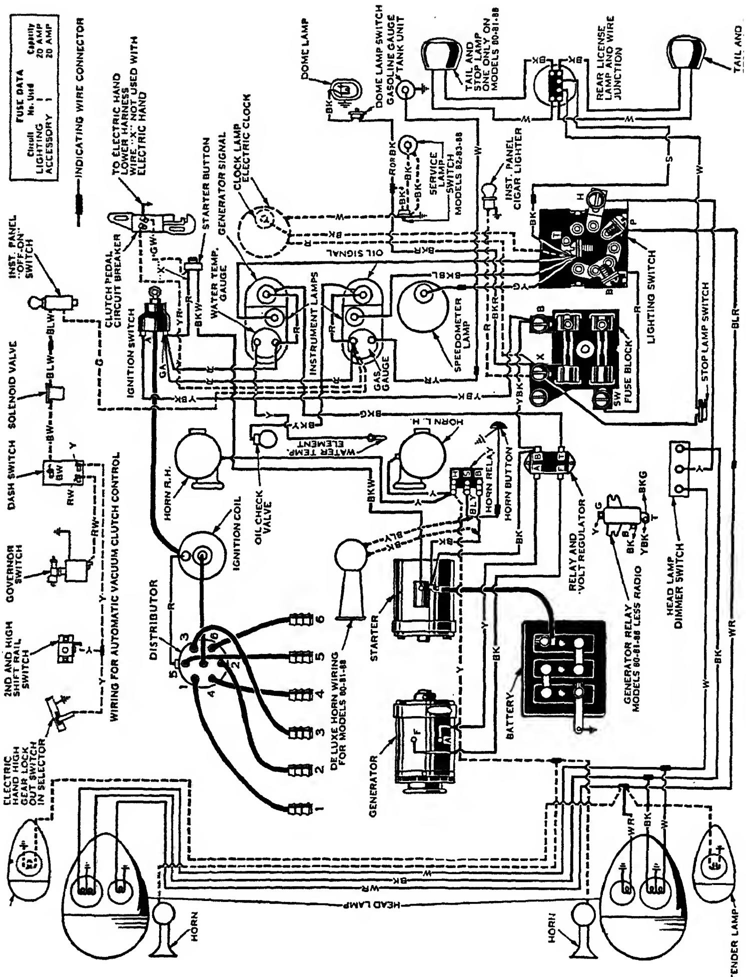
Gear Ratio 4.55-1 Hypoid Gears

Axle Semi-Floating

Brakes Lockheed Hydraulic
- **Front** 19$\frac{11}{16}$″ x 2¼″ x $\frac{3}{16}$″ Clearance Anchor .005″ Piston .010″
- **Rear** 19$\frac{11}{16}$″ x 2¼″ x $\frac{3}{16}$″ Clearance Anchor .005″ Piston .010″
- **Hand** Rear Service

Lining Moulded

Diagram 38-24



TERRAPLANE WIRING DIAGRAM, 1938, SERIES 81
Courtesy of Hudson Motor Car Company

Terraplane Model 6-Cylinder Year 1938 Series 81

Battery	National	**Type** 17 Plate	**Volts** 6	**Amps.** 105
		Frame Connection	Positive	
Lighting	Mazda 2331	**Head Lights**	32-32 C.P., 6-8 Volts	
	Mazda 51,55,1158	**Dash, Tail and Stop**	1½-3-21 C.P., 6-8 Volts	
	63	**Side Lights**	3 C.P., 6-8 Volts	

Starter and Generator Auto-Lite

Generator Hot
- **Max. Chg. Rate** 18 Amps. **Speed**
- **Regulation** 3rd Brush **Cut-In** 7.0 Volts
- **Relay Air Gap** **Contact Gap**

Ignition
- **Contact Breaker Gap** .020″
- **Spark Plug—Size** 14 M.M. Champion **Gap** .032″
- **Firing Order** 1-5-3-6-2-4
- **Timing** T.D.C. Retard

Engine **Bore** 3″ **Stroke** 5″ **Taxable H.P.** 21.6
- **Piston Ring—Width** Oil 2—3/16″; Comp. 2—3/16″
- **Diam.** 3″ **Gap** .009″-.011″
- **Oiling—Type** Plunger **Capacity** 6 Qts.

Valves
- **Intake Timing—Open** 10½° B.T.C. **Close** 60° A.B.C.
- **Intake Clearance** .006″ Hot
- **Exhaust Timing—Open** 50° B.B.C. **Close** 18½° A.T.C.
- **Exhaust Clearance** .008″ Hot

Carburetor Carter

Cooling System Centrifugal **Type** Pump **Capacity** 12½ Qts.

Steering Caster 1°-2°, Camber 1°-1½°, Toe In 0-⅛″

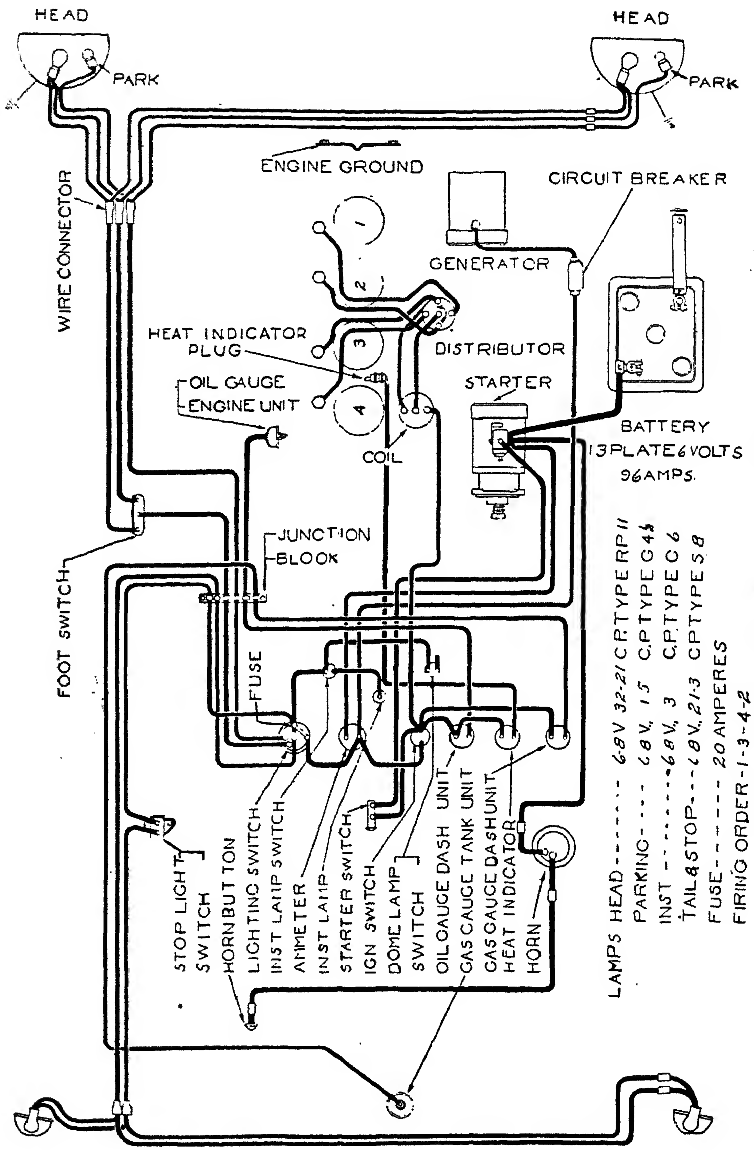
Clutch Single Plate **Facings** Cork Insert 5⅜″ x 8⅝″ x .203″

Gear Ratio 4⅛-1

Axle Semi-Floating Spiral Gears

Brakes Bendix Hydraulic
- **Front** 22⅛″ x 1¾″ x 7/32″ Clearance .010″
- **Rear** 22⅛″ x 1¾″ x 7/32″ Clearance .010″
- **Hand** Rear Service
- **Lining** Moulded

Diagram 38-25



WILLYS WIRING DIAGRAM, 1938, SERIES 38
Courtesy of Willys-Overland Incorporated

Willys Model 4-Cylinder Year 1938 Series 38

Battery U. S. L. **Type** 13 Plate **Volts** 6 **Amps.** 96
Frame Connection Negative

Lighting RP-11 **Head Lights** 32-21 C.P., 6-8 Volts
G6 and 58 **Dash, Tail and Stop** 3-3-21 C.P., 6-8 Volts
G 4½ **Side Lights** 1-5 C.P., 6-8 Volts

Starter and Generator Auto-Lite

Generator Cold **Max. Chg. Rate** 16 Amps. **Speed** 2500 R.P.M.
Regulation 3rd Brush **Cut-In** 7 Volts
Relay Air Gap **Contact Gap**

Ignition **Contact Breaker Gap** .020″
Spark Plug—Size 18 M.M. Champion **Gap** .025″
Firing Order 1-3-4-2
Timing 5° A.T.C. Retard

Engine **Bore** 3⅛″ **Stroke** 4⅜″ **Taxable H.P.** 15.6
Piston Ring—Width Oil 1—13/16″; Comp. 3—3/32″
Diam. 3⅛″ **Gap** .008″
Oiling—Type Pump **Capacity** 4 Qts.

Valves **Intake Timing—Open** T.D.C. **Close** 45° A.B.C.
Intake Clearance .010″ Cold
Exhaust Timing—Open 40° B.B.C. **Close** 5° A.T.C.
Exhaust Clearance .010″ Cold

Carburetor Tillotson

Cooling System Centrifugal **Type** Pump **Capacity** 11 Qts.

Steering Camber 2°, Caster 3°, Toe In 3 3/32″

Clutch Borg & Beck **Facings** Moulded 5⅛″ x 7⅞″ x ⅛″ 2 Required

Gear Ratio Ring Gear 43 Pinion 10

Axle Semi-Floating Spiral Gears

Brakes
Bendix
Mechanical
Front 19 3/16″ x 1¾″ x **Clearance** .010″
Rear 19 3/16″ x 1¾″ x 3/16 **Clearance** .010″
Hand 4 Wheels

Lining Moulded

Diagram 38-26

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